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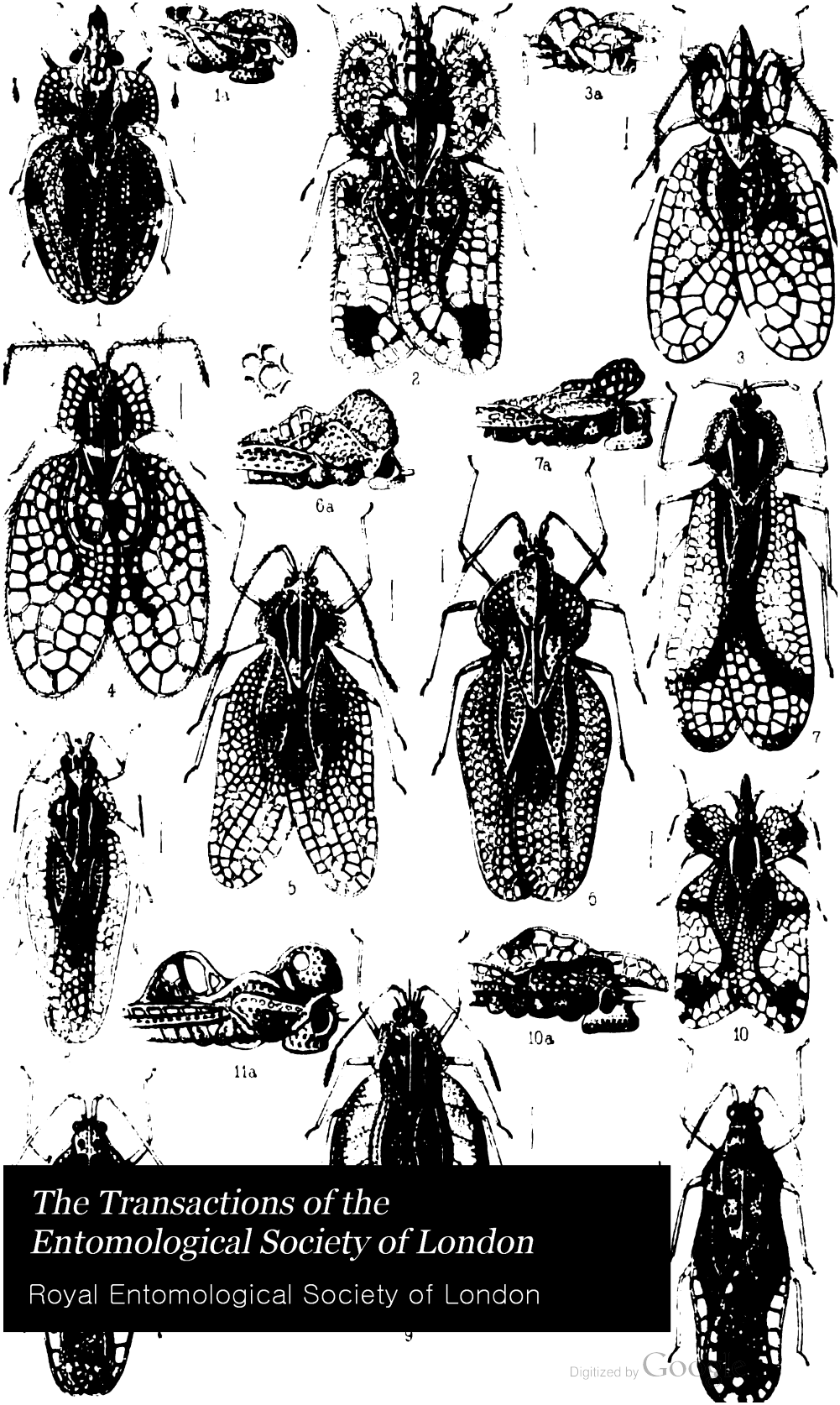

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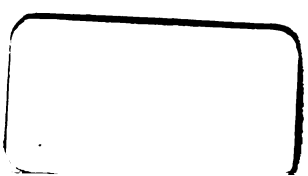

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LONDON:

PRINTED FOR THE SOCIETY BY RICHARD CLAY AND SONS, LIMITED,
LONDON AND BUNGAY.

SOLD AT THE SOCIETY'S ROOMS, 11, CHANDOS STREET,
CAVENDISH SQUARE, W.,

AND BY LONGMANS, GREEN, AND CO.,
PATERNOSTER ROW, E.C.; AND NEW YORK.

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DATES OF PUBLICATION IN PARTS.

Part I. (TRANS., pp. 1–120, PROC., i–viii) was published 20th April, 1898.

„ II. („ 121–208, „ ix–xx) „ 29th June, „

„ III. („ 209–380, ————————) „ 30th Sept., „

„ IV. („ 381–444, „ xxi–xxxvi) „ 22nd Dec., „

V. (———————— „ xxxvii–lxxxviii) „ 9th Feb., 1899

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ERRATA.

TRANSACTIONS.

Page 160, line 7, for 10 mm. read 20 mm.

Page 164, line 22, for *Macropalpus* read *Mucropalpus*.

Page 215, group viii, pages 230 and 232 throughout, for *epispodea* read *epipsodea*.

Pages 233, 234, and 235 throughout, for *magdalina* read *magdalena*.

Page 233, line 2 from bottom, for Erebiar read Erebia.

Page 251, line 13, for tenuen read termen.

Page 294, line 17, for description of read description and.

Page 304, line 10, for Pétersb., ii, read Pétersb., iii.

Page 319, line 7 from bottom, for Ill. Typ. Lep. Het., ii read Ill. Typ. Lep. Het., iii.

Page 332, after line 7 insert:

Genus Pseudopsyche.

Oberth., Diagn. Lep. Askold, p. 7 (1879).

Page 333, lines 20 and 21, for Wa-Sen-Kow read Wa-Ssu-Kow.

Page 349, line 8, for (1857) read (1879).

Page 352, line 16, for p. 22 read p. 23.

Page 357, line 4, for (1814) read (1804?)

Page 406, line 9, for *fasciatus* read *signatus*.

Page 442, line 7, for *cænulatus* read *cærulatus*.

PROCEEDINGS.

Page iii, line 6 from bottom, for *Isoderma* read *Isodermus*.

Page xviii, lines 13 and 14, for *bertolinii* read *bertolonii*; line 17, for *rosserii* read *roserii*; No. 11 and Nos. 26, 27, and 28 on page xix should be included under Muscidæ.

Page xxi, line 17, for for exhibition read an offer from a collector to obtain.

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1892 THORNLEY, the Rev. A., M.A., *South Leverton Vicarage, Lincoln.*
1897 TOMLIN, B., *The Green, Llandaff.*
1893 TOWNSEND, Professor C. H. Tyler, *Las Cruces, New Mexico, U.S.A.*
1859 † TRIMEN, Roland, F.R.S., F.L.S., PRESIDENT, c/o The Entomological Society of London, 11, *Chandos-street, Cavendish-square,* W.
1895 TUNALEY, Henry, 30, *Fairmont-road, Brixton Hill,* S.W.
1897 TUNSTALL, Wilmot, *Brook House, Meltham, Huddersfield.*
1898 TURNER, Dr. A. J., *Wickham-terrace, Brisbane, Queensland.*
1893 TURNER, Henry Jerome, 13, *Drakefell-road, St. Catharine's Park, Hatcham,* S.E.
1894 TURNER, Thomas, *Cullompton.*
1886 TUTT, J. W., *Rayleigh Villa, Westcombe Park, Blackheath,* S.E.

1893 URICH, Frederick William, *Caparo Valley Railway, Trinidad British West Indies.*

1866 VERRALL, George Henry, VICE-PRESIDENT, *Sussex Lodge, Newmarket.*
1897 VICE, William A., M.B., *Belvoir-street, Leicester.*
1889 VIVIAN, H. W., M.A., *Glenafon, Taibach, Port Talbot.*

1895 WACHER, Sidney, F.R.C.S., *Dane John, Canterbury.*
1897 WAINWRIGHT, Colbran J., 2, *Handsworth Wood-road, Handsworth Birmingham.*
1876 WAKEFIELD, Charles Marcus, F.L.S., *Belmont, Uxbridge.*

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1870 WALKER, The Rev. Francis Augustus, D.D., F.L.S., *Dun Mallard, Cricklewood*, N.W.

1878 WALKER, James J., R.N., F.L.S., 23, *Ranelagh-road, Marine Town, Sheerness.*

1863 † WALLACE, Alfred Russel, D.C.L., Oxon., F.R.S., F.L.S., F.Z.S., *Corfe View, Parkstone, Dorset.*

1866 † WALSINGHAM, The Right Honble. Lord, M.A., LL.D., F.R.S., F.L.S., F.Z.S., High Steward of the University of Cambridge, *Merton Hall, Thetford, Norfolk*; and 66*a*, *Eaton-square*, S.W.

1886 WARREN, Wm., M.A., 80, *Frithville-gardens, Shepherd's Bush*, W.

1869 WATERHOUSE, Charles O., *Ingleside, Avenue-gardens, Acton*, W.; and *British Museum (Natural History), Cromwell-road*, S.W.

1893 WEBB, John Cooper, 218, *Upland-road, Dulwich*, S.E.

1876 † WESTERN, E. Young, 36, *Lancaster Gate, Hyde Park*, W.

1886 WHEELER, Francis D., M.A., LL.D., *Paragon House School, Norwich.*

1865 WHITE, The Rev. W. Farren, M.A., 16, *Churchfield-road, Ealing*, W.

1884 WHITE, William, *The Ruskin Museum, Meersbrook Park, Sheffield.*

1896 WILEMAN, A. E., c/o H.B.M.'s Consul, *Kobe, Japan.*

1894 WILSON, Edwin, *Post Office-terrace, Cambridge.*

1894 WOLLEY-DOD, F. H., Box 225, *Calgary, Alberta, N.W.T., Canada.*

1881 WOOD, The Rev. Theodore, 157, *Trinity-road, Upper Tooting*, S.W.

1894 WOOLF, Michael Yeatman, 4, *St. John's Wood Park*, N.W.

1897 WRIGHT, Dudley D'A., F.R.C.S., L.R.C.P., 55, *Queen Anne-street*, W.

1891 WROUGHTON, R. C., Conservator of Forests, Indian Forest Service, *Bombay, India*; and c/o Army and Navy Co-operative Society, Ltd., 105, *Victoria-street*, S.W.

1888 YERBURY, Colonel John W., late R.A., F.Z.S., *Army and Navy Club, Pall Mall*, S.W.

1892 YOUDALE, William Henry, F.R.M.S., 29, *Market Place, Cockermouth.*

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MAY 10 1898

TRANSACTIONS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1898.

I. *On some new or little-known Species of African Butterflies.*

By ROLAND TRIMEN, F.R.S., F.L.S., Pres. Ent. Soc. Lond.

[Read November 3rd, 1897.]

PLATE I.

THE butterflies here described are the following, *vid.*:—

ACRÆINÆ.

Acræa hypoleuca, sp. n.

LYCÆNIDÆ.

Lycæna gigantea, sp. n
Desmolycæna (g. n.) *mazoensis*, sp. n.
Aphnæus erikssoni, Trim., ♂.
Iolaus alienus, sp. n.
Durbania pallida, sp. n.
Mimacræa marshalli, sp. n.

HESPERIIDÆ.

Pyrgus delagoæ, sp. n.

The Lycænidæ are all natives of Mashunaland, and have been sent to me by Mr. G. A. K. Marshall. The actual locality of the *Acræa* is not known; the unique ♂ example

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is in the Hope Department of the Oxford University Museum, and was kindly lent by Prof. Poulton for description. The *Pyrgus* was taken by the Rev. H. Junod at Delagoa Bay, and is in his collection at Neuchâtel.

One of the Lycænidæ presents characters in combination that amount to generic value, and I propose for it a new genus, *Desmolycæna*. Two others, *Lycæna gigantea* and *Mimacræa marshalli*, exhibit mimetic relations with the protected group Acræinæ, but the former to a less extent than the latter.

Fam. NYMPHALIDÆ.

Subfam. ACRÆINÆ.

Genus ACRÆA.

Acræa hypoleuca, sp. n. (Pl. I, fig. 1).

♂. *Exp. al.*, 2 in. 2 lin. *Fulvous-ochreous, each wing with the following black markings, vid.*:—two disco-cellular spots (one being terminal); an irregular discal series of seven spots; and a hindmarginal border containing pale spots; cilia white, narrowly interrupted with fuscous at extremities of nervules. *Forewing*: costa narrowly edged with black; spot in cell subreniform, just beyond origin of 1st median nervule; terminal cellular spot attenuated superiorly; below median nervure a small slender oblique spot; in discal series, the first three spots are united and form, with the smaller separate fourth spot, a narrow rather oblique subapical bar between costa and 3rd median nervule,—the fifth is round, nearer base, between 2nd and 3rd median nervules,—the sixth, also rounded, is between 2nd and 1st median nervules, immediately below terminal disco-cellular spot,—and the seventh is reniform, below 1st median nervule and not far from posterior angle; hindmarginal border rather narrow, enclosing eight rather large (but inferiorly diminishing) almost contiguous spots of the ground-colour, so that these are outwardly bounded only by a linear black edging of even tenuity, but inwardly by much wider black, which is a little diffuse, and, while of even width near costa, becomes unequal and strongly dentated inwardly between nervules below 2nd radial. *Hindwing*: a very narrow blackish suffusion at base; spot in cell oblique, narrow, just above origin of 1st median nervule; spot at extremity of cell very small; in discal series, the spots are smaller than in

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forewing, the 4th being smallest and farthest from base, and the 1st and 6th nearest to base; hindmarginal border of even and moderate width (its inner edge very slightly irregular), enclosing seven small but rather conspicuous rounded white spots, of which the last, at anal angle, is geminate. UNDERSIDE.—*Hindwing and broad apical bar of forewing white*; disco-cellular and discal spots as on upperside. *Forewing*: in discoidal cell an additional small sub-basal black spot, preceded by a black dot; black on inner side of hindmarginal border thin and diffuse, and partly effaced by radiation of the apical white along the nervules as far as 2nd median. *Hindwing*: on costa at base a fulvous-ochreous spot; bases of nervures clouded with black; the following additional black spots, *vid.*:—a small one on costa very near base; a large, elongate, sub-basal one between costal and subcostal nervures; a similar large elongate one between median and submedian nervures; and two small spots below submedian nervure; on the right side only, there is a very small spot near base in discoidal cell; an eighth spot in discal series, below submedian nervure; white spots in hindmarginal black border very much larger than on upperside, and outwardly bounded by a merely linear black edging.

Palpi ochre-yellow; *abdomen* pale dull creamy-ochreous, clouded with blackish in its basal part.

From its nearest ally, *A. chilo*, Godm., ♂, this remarkable species differs in its (1), much reduced black markings throughout—especially, on the upperside, the sub-basal disco-cellular spot in the forewing, and the basal clouding in the hindwing; (2), small white and rounded spots—as in *A. violarum*, Boisd.—in the hindmarginal black border of the hindwing on the upperside, instead of large dull-reddish crescentic ones; (3), more ochreous ground-colour of upperside, in tint like that of *A. anacreon*, Trim.; and (4), much purer white of hindwing and apex of forewing on underside. Another curious feature in this *Acræa* is that, although clearly belonging to the *zetes* and *acara* group and a close ally of *A. chilo* and *A. barberi*, Trim., yet the hindmargin of the forewings is not incurved about the median nervules as in that group, but is even and almost straight, as in *A. violarum* and *A. nohara*, Boisd.

The only example known to me is in the Oxford University Museum, where Prof. Poulton most kindly brought it to my notice; it bears a ticket "Coll. Watson, 1871," but unfortunately no record of locality. It is unquestion-

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ably African, and I think not unlikely to prove a native of some dry and elevated part of the S. W. tropical area. The pure-white underside of the hindwings and apices of the forewings is very striking and peculiar, and must make the butterfly highly conspicuous in repose; and in life there can be little doubt that the rufous of the entire upperside and of the forewings on the underside was of a much brighter and livelier tint than is now seen in the specimen—red colouring in the *Acrææ* invariably fading greatly after death.

Fam. LYCÆNIDÆ.

Lycæna gigantea, sp. n. (Pl. I, figs. 2, ♂; 3, ♀).

Exp. al. (♂) 2 in. 1 lin.; (♀) 2 in. 2½ lin. Allied to *L. leucon*, Mab., but much larger.

♂. *Rather dull pale lilacine-blue, with a pinkish tinge*; the conspicuous spotting of the underside showing faintly through the wings; a rather strongly-marked black hindmarginal edging streak; cilia blackish, faintly tipped with whitish and mixed with whitish at posterior angle of forewing, and between 2nd median nervule and anal angle of hindwing. *Forewing*: an almost linear terminal disco-cellular black striola, which looks diffused on both sides owing to the large broad corresponding marking on the underside showing through. *Hindwing*: between 1st and 2nd median nervules a hindmarginal small blackish spot, scaled with bluish-white, and bounded internally by a very faint stain of orange; a similar but much smaller and fainter hindmarginal spot immediately above submedian nervure; at extremity of 1st median nervule a short rather thick black tail. UNDERSIDE.—*Dull-white, with conspicuous black spots*; costal border of both forewing and hindwing, and neuration generally, ochre-yellowish, and a tinge of the same tint over hindwing generally. *Forewing*: terminal disco-cellular spot much the largest on the entire underside, very broad, reniform; discal series irregular, consisting of 8 spots—of which the 1st (on costa), the 7th, and the 8th (geminate, below 1st median nervule), are much smaller than the rest, and in a line with the round 2nd and 5th spots—the round 3rd and the much larger and obliquely-elongated 4th are beyond the rest,—and the ovate 6th (between 1st and 2nd median nervules) is before the rest; a well-marked submarginal black streak, interrupted regularly on each nervule, from costa to submedian nervure; hindmargin edged with a sharply-defined thin black line. *Hindwing*: a sub-basal series of three round spots—of

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which the largest is between costal and subcostal nervures, a smaller one in discoidal cell, and the smallest on inner margin; terminal disco-cellular marking elongate, curved, but little more than a third of the width of the corresponding marking in forewing; eight spots in irregular discal series decreasing in size from costa to inner margin,—the 1st, 6th, and 8th before, and the 3rd and 4th beyond, the remaining three; submarginal black streak situated as in forewing, but lunulate, and with much wider interruptions on nervules,—its 6th lunule faint orange-yellow, instead of black; hindmarginal black spot just beyond this orange-yellow lunule and smaller black spot at anal angle, thickly scaled with bluish-silvery; a few black scales between the two spots; hindmarginal black edging linear.

♀. *Pale-greyish, inclining to whitish on discs;* both wings, except along costal and hindmarginal borders, shot with pale-blue,—the former strongly, the latter slightly. *Forewing*: terminal disco-cellular marking very large and broad, as on underside, but not so sharply defined; a submarginal ill-defined dusky stripe, succeeded by some very indistinct, sublunulate whitish marks. *Hindwing*: a submarginal ill-defined lunulate dusky stripe, immediately succeeded by a series of tolerably distinct whitish lunules, of which the three lower ones at their extremities unite with a white streak immediately preceding the black hindmarginal edging streak; blue-scaled black spot between 1st and 2nd median nervules considerably larger than in ♂, and the preceding orange lunule better defined. Underside as in ♂.

A very worn female of this species in the British Museum, from Lake Nyanza, has been associated erroneously by Mr. A. G. Butler with the female of his *Castalius hypoleucus* (Proc. Zool. Soc. Lond., 1893, pp. 660—61), from Lake Nyassa.* The Nyanza female in question still retains part of the tail on the hindwing—an appendage wholly absent in *L. perpulchra* (*hypoleuca*).

The nearest ally of *L. gigantea* is *L. leucon*, Mab., a native of Madagascar, which is, however, very much smaller, the male being barely 1 in. 3 lin. in expanse of wings, and on the upperside of a pure sky-blue, with paler discs, and a well-defined narrow black hindmarginal

* As the Rev. Dr. Holland has pointed out (Proc. U.S. Nat. Mus., xviii, p. 239, 1895), *C. hypoleucus* is identical with his *Lycæna perpulchra* described in the 'Entomologist' for September, 1892, as well as with my own *Lycæna exclusa* (Proc. Zool. Soc. Lond., 1894, p. 47, pl. vi, fig. 11, ♂).

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border in the forewing, as well as sublunulate linear dark marks in the hindwing. On the underside the two species in the main agree; but in the forewing, *L. gigantea* has actually and relatively much larger terminal disco-cellular and discal spots, and a much stronger and more continuous submarginal black streak, but it wants the succeeding marginal series of black spots found in *L. leucon*; while in the hindwing the spots are all relatively smaller, and (as in the forewing) there are no hindmarginal spots except the blue-scaled ones below 2nd median nervule,—the tail being shorter and not white-tipped.

L. gigantea is not so nearly allied to either *L. perpulchra* or *L. mashuna*, Trim., which are similarly characterised by the heavy black spotting of the underside * but have no tail on the hindwing. The extraordinary size of the terminal disco-cellular spot, and the great elongation of the fourth spot of the discal series, in the forewing, and the black subterminal streak in both wings are features of the underside which at once distinguish *L. gigantea*. The lilacine-blue tint of the male on the upperside brings it nearer to *L. mashuna*, but the dull-white ground of the underside resembles that of *L. perpulchra*. The very much greater size is also of importance, *L. gigantea* being the largest *Lycæna* known to me, while *L. perpulchra* does not exceed 1 in. 9 lin. (♀) and *L. mashuna* 1 in. 8 lin. (♀) in expanse of wings.

Five specimens of this exceedingly fine *Lycæna* were taken by Mr. Marshall, a male in the Mazoe Valley on the 16th October, 1894, and three other males with a female at Gadzima, Umfuli Valley, Mashunaland, on 18th December, 1895. The first-named male was flying through fairly thick bush in which there were few or no flowers, and settled on the ground among some dead leaves.

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* There is some ground for believing that this great and unusual development of the black spots on the underside is in imitation of certain *Acrææ*, especially in the case of *L. mashuna*, in which the ground-colour is ochre-yellow. Mr. Marshall wrote to me that on 20th October, 1894, he saw two of this *Lycæna* sleeping on the end of a stem of dry grass among a number of *Acræa nohara* and *A. caldarena*, and was struck with the general similarity of their underside to that of the *Acrææ*; he also noticed that in the attitude of repose the forewings of the *Lycæna* were well depressed between the hindwings, giving the insect the elongate outline of an *Acræa*.

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DESMOLYCÆNA, gen. n.

Allied to the genera *Lycænesthes*, *Hypolycæna*, and *Zeritis*.

♂ Head small: eyes smooth; palpi long, porrect, not rising more than half-way to vertex, the second joint decidedly long, flattened laterally, and inferiorly densely clothed with elongate erect scales, and the terminal joint very short, slender, cylindrical, rather blunt, clothed with closely-appressed scales; antennæ long (almost three-fifths as long as costa of forewing), rather slender, but with very well-developed, elongate, cylindrical, blunt club. Thorax rather slender. Forewings rather elongate, with somewhat acute apex; hindmargin incurved a little above posterior angle, costa and inner margin nearly straight; costal nervure ending about middle of costa; subcostal nervure 4-branched—the 1st nervule originating a long way and the 2nd a moderate distance before extremity of discoidal cell,—the 3rd (very short) originating considerably nearer to apex than to extremity of cell, and the 4th running to apex itself; upper radial united to subcostal nervure a little beyond extremity of cell, lower radial originating rather nearer to subcostal than to median nervure. Hindwings slightly lobate at anal angle, and bearing a rather long moderately-slender tail at extremity of submedian nervure: costa beyond basal prominence very slightly curved; costal nervure extending to apex; subcostal nervules originating a little before extremity of discoidal cell. Legs rather short, moderately stout; tarsi of first pair rather long, with inferior bristles well developed.

TYPE: *Desmolycæna mazoensis*, sp. n.

I am unable satisfactorily to assign the Lycænide above characterised to any recognised genus, and therefore propose a new one for it, although hesitating to do so in the absence of any specimen of the female. In neuration this butterfly is in agreement with the genus *Lycænesthes*, but is of far more slender structure throughout: it has porrect palpi with short and blunt (instead of long and acuminate) terminal joint; longer antennæ with cylindrical and blunt (instead of flattened and acuminate) club; a single longish sublinear tail on the hindwings instead of 3 slender pencils of short hairs; and an underside pattern and colouring altogether different from that of *Lycænesthes*. From *Hypolycæna* the new form differs markedly in palpi,

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neuration (especially in having one more subcostal nervule in the forewings), outline of wings, and *Zeritis*-like underside; but agreement between the two genera is found in the antennæ, the slender structure, and the colouring of the upperside. The relation to *Zeritis* is shown towards the rather aberrant section of that genus which wants the usual fifth branch of the subcostal nervure in the forewings, and includes *Z. chrysantas*, Trim., and *Z. leroma* (Wallgr.); and it is the last-named species to the colouring of whose underside that of *D. mazoensis* exhibits so much resemblance.

Desmolycæna mazoensis, sp. n. (Pl. I, fig. 4).

♂ *Exp. al.* 11½ lin.—1 in. *Greyish-brown, strongly shot throughout with bright violaceous*; hindmargins with a linear fuscous edging; cilia white; on submedian nervure of hindwing a linear black tail, reddish at base and conspicuously white at tip. UNDERSIDE.—*Pale brownish-grey, with numerous silvery and black spots*; a hindmarginal linear black edging emitting a short acute projection on each nervule; in each wing the following silvery spots, *vid.*: a linear transverse terminal disco-cellular mark, finely dark-edged on both sides; some sub-basal and cellular spots; a highly irregular discal series of eight; and a regular submarginal series: all these silvery spots slender and many sublinear, most of them edged in parts with some black scales, *and each* (except the terminal disco-cellular ones, two in discoidal cell of forewing, and one close to anal angle of forewing, and one close to anal angle of hindwing) *succeeded by a completely separate black spot of corresponding size. Forewing*: A short silvery streak along lower edge of costal nervure near base, some silvery scales near costal margin, and three spots in discoidal cell towards the extremity; the exceedingly irregular discal series of spots is preceded by a subcostal row of three, placed longitudinally between 1st subcostal and upper radial nervules, the outermost of these making the uppermost of the discal series of six; the black spots accompanying these discal ones increasing in size downward to below 1st median nervule; below median nervure and its 1st nervule a sub-basal black spot followed by a premedian one. *Hindwing*: some silvery basal scales, succeeded by a partly indistinct series of five very small silvery and blackish spots running straight from costa to inner-margin—the 3rd spot being in discoidal cell; a sub-basal series of three elongate silvery marks, with accompanying separate black marks, between costal and submedian nervures—the middle

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pair being in cell towards extremity; in discal series of spots the first, seventh, and eighth are largest and most elongate, while the fifth (in fork of second and third median nervules) is minute; 8 silvery marks in submarginal series, of which the last is elongate and extends from submedian nervure to inner-margin; between the 7th mark and a silvery hindmarginal spot is an orange-yellow mark, and at anal angle a large round black spot.

Described from four examples, which vary somewhat in the size and distinctness of the black spots of the underside.

On the upperside this butterfly looks very like an ordinary *Lycænesthes* or *Hypolycæna*, but the underside pattern and markings are quite unlike anything in those genera, and come near to those found in *Aphnæus pseudozeritis*, Trim., while their colouring resembles that of the more brightly marked examples of *Zeritis leroma* (Wallgr.). The singular association of an entirely separate black spot with nearly every silvery spot is altogether peculiar, and at first sight renders it difficult to gain a clear idea of the actual pattern.

Mr. G. A. K. Marshall wrote that he had taken eleven males, but no female, of this curious little species in the Mazoe River district of Mashunaland during the last ten days of October, 1894; he notes it as abundant about the same "machabel" trees at the top of a kopje that were frequented by *Aphnæus erikssoni* and its congeners.

Genus APHNÆUS.

Aphnæus erikssoni, Trim. (Pl. I, fig. 5, ♂).

♀. *Aphnæus erikssoni*, Trim., Proc. Zool. Soc. Lond., 1891, p. 86, n. 65; pl. ix, fig. 15.

♂ *Exp. al.* 1 in. 6½–7½ lin. Ground-colour brighter and deeper in tint than that of the ♀, more ferruginous, and bounded hindmarginally by an ill-defined narrow fuscous border; forewing with the discal yellow-ochreous spots redder in tint and better defined, *and with a small irregular basi-inner-marginal patch of bright metallic blue. Forewing*: a narrow fuscous cloud along costal margin; terminal disco-cellular spot narrow, vertical; 5 discal spots rounded, distinct, ringed with dark scales; blue patch from base

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lying mainly between median nervure and inner-margin but encroaching on discoidal cell at base, extending superiorly not much beyond origin of 1st median nervule, but inferiorly along inner-margin to beyond middle, where it ends abruptly and truncately; in discoidal cell, at about its middle, a metallic-blue spot, variable in size and distinctness. *Hindwing*: a moderately-wide basal fuscous space, with a faint gloss of blue which extends over lower part of discoidal cell and along 1st median nervule; inner-marginal fold dull pale-yellowish, densely clothed with grey hair, which becomes whitish just before anal angle; on disc beyond middle on each side of radial nervule, a small yellowish fuscous-ringed spot, marked with some blue scales. *Cilia* white, with rather wide brownish interruptions at ends of nervulea. UNDERSIDE.—As in ♀, but of a deeper more rufous tint throughout; the spots better defined (especially the hindmarginal spots in the forewing), and those in the hindwing decidedly larger. *Forewing*: inner-marginal area dull-whitish, with a subnacreous gloss which is brighter near base.

As pointed out (*loc. cit.*) in my remarks on the female type of this species, *A. erikssoni* appears a much isolated member of the genus as far as colouring goes, though structurally belonging to the group of *orcas*, Drury, and *hutchinsonii*, Trim. The single example on which I founded the species was taken in S. W. Africa (at Ehanda, in South Ambuella) by Mr. A. W. Eriksson in September, 1887. The six males now described were captured by Mr. G. A. K. Marshall at Gadzima, Umfuli River, Mashunaland, on the 1st, 6th, 17th, and 20th September, 1895. Four other examples of the male were taken previously on 25th October, 1894, in the Mazoe district to the north of Salisbury, and two of them were sent to me by Mr. Marshall, but these were not in fit condition for description. The Mazoe specimens are noted as flying with other Lycænidæ round "machabel" trees at the summit of a kopje.

Genus IOLAUS.

Iolaus alienus, sp. n. (Pl. I, fig. 6, ♂).

♂ *Exp. al.* 1 in. 4—6 lin. *Glossy pale-blue; with a greyish-fuscous border, which is exceedingly broad in apical area of forewing. Forewing*: blue from base occupying area between subcostal nervure and inner-margin, extending throughout discoidal cell (except at ex-

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tremity where it is bounded by a very ill-defined black mark), to beyond middle over basal parts of median nervules and on submedian nervure, but narrowing to about middle on inner-marginal edge; a dull-grey costal border from base to extremity of cell. *Hindwing*: some blue scaling at base and along median nervure; blue area extending from about middle to hindmargin, and from above 2nd subcostal nervule to submedian nervure, but with a narrow fuscous hindmarginal edging which becomes black and linear towards anal angle; a good-sized black spot on hindmargin between 1st and 2nd median nervules, and a similar spot on anal-angular lobe; basicostal sexual glossy patch very large but not sharply defined, its lower portion occupying discoidal cell; tails on 1st median nervule and submedian nervure black, tipped and inwardly edged with white —the former short and almost linear, the latter more than twice as long and rather wide (especially at base); a rather dense fringe of whitish hair along inner-margin beyond middle. Cilia fuscous generally, but white on inferior part of hindwing. UNDERSIDE.—*White, with two subcostal dark-brown spots in forewing, and one in hindwing*; a common interrupted sublunulate brown submarginal line, and a narrow pale-brown hindmarginal border. *Forewing*: larger dark-brown spot subreniform, at extremity of discoidal cell; smaller one about midway between this and apex but close to costa, more ovate; below this spot faint fragments of a linear brown discal streak to below 2nd median nervule; inner-marginal sexual tuft of bristles black. *Hindwing*: dark-brown spot between costal nervure and 1st subcostal nervule large, oblong, conspicuous; below it a very much smaller contiguous spot is the commencement of a transverse, irregular, interrupted discal brown line, which terminates in a black W close to inner margin; two black hindmarginal spots strongly marked and sprinkled with a few bluish-silvery scales; lunule of submarginal streak immediately before superior black spot orange-yellow.

I do not know any *Iolaus* to which this species is nearly allied. Like *I. sidus*, Trim., and *I. mimosæ*, Trim., the subcostal nervure of the forewing has four branches; but the apical part of the forewing is remarkably prolonged, occasioning a corresponding incurve of the hindmarginal outline between 2nd and 1st median nervules, and the anal-angular part of the hindwing is also much produced and exceptionally acute at the extremity of the submedian nervure. The underside markings are very peculiar, owing to the expansion into a conspicuous spot in both wings of the commencement of the discal streak, while the rest

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of the streak is very feebly marked in the hindwing, and all but wanting in the forewing; besides which the terminal disco-cellular mark of the forewing is strikingly enlarged.

I have seen only the two males here described, which Mr. G. A. K. Marshall informs me were taken by himself at Gadzima, Umfuli River, Mashunaland, on 13th September, 1895. They were found at the summit of an isolated kopje, in company with *Iolaus trimeni*, Wallgr., which they resembled in flight and habits.

Genus DURBANIA.

Durbania pallida, sp. n. (Pl. I, figs. 7, ♂; 8, ♀).

Exp. al. (♂) 11½ lin. (♀) 1 in. 1½ lin. ♂ *Pale ochre-yellow*; *forewing with dull-brownish costal marking and apical border*; cilia in both wings brownish, with dark-brown interruptions at extremities of nervules. *Forewing*: apical border narrow, sprinkled with ochre-yellow scales, and extending only from costa just before 3rd subcostal nervule to hindmargin a little below lower radial; transverse costal marking rather beyond middle, narrow, ill-defined inwardly, extending from costa to lower radial; before middle, indications of some faint brownish markings along costa. *Hindwing*: unmarked, except by the dark-brown interruptions of the cilia, which are more conspicuous than in forewing. UNDERSIDE.—Hindwing and markings of forewing dull pale-grey, varied with indistinct dull-reddish spots. *Forewing*: discoidal cell from base to extremity tinged with ochreous-orange, but inner-marginal area widely pale-yellowish; a narrow costal grey border from base, interrupted by three almost equidistant small square spots of the ground-colour; costal marking prolonged as far as third median nervule; apical border prolonged throughout hindmargin but narrowing to a point at posterior angle—traces of its two series of reddish spots barely perceptible; two disco-cellular small grey spots, one terminal, the other a little before it. *Hindwing*: of five transverse series (about equidistant) of dull-reddish spots, the subbasal, premedian, and median are fairly marked, but the discal and submarginal scarcely visible; indications of two or three small spots at base.

♀ *Paler throughout*; especially on *underside*, where only the costal bar in forewing is dark (the cellular and adjacent costal markings being faint), while the apical hindmarginal border and

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the entire hindwing are of a dull creamy tint slightly tinged with reddish, and with the various series of spots faintly marked, paler than ground-colour, but with darker outlines.

This *Durbania* is nearly related to *D. aslauga*, Trim., but is readily distinguishable by its very much paler colouring and (in the male) by the very great reduction of the dark markings of the forewing. The females of the two forms are much closer as regards the latter character, but on the underside are strikingly dissimilar, *D. aslauga* ♀ closely resembling the male in colouring, while *D. pallida* ♀ is of extreme paleness, especially as regards the spots of the hindwing.

The male and female described were taken by Mr. G. A. K. Marshall at Gadzima, Umfuli River, Mashunaland, on 28th and 31st August, 1895, respectively.

Genus Mimacræa.

Mimacræa marshalli, sp. n. (Pl. I, fig. 9).

Exp. al. 1 in. 10½ lin.—2 in. *Fulvous-ochreous; apical half of forewing fuscous with white subapical bar; hindwing with rather narrow fuscous hindmarginal border. Forewing*: a widening fuscous costal border from base, becoming merged in apical fuscous about middle; confluent with this border is a terminal disco-cellular fuscous spot; apical fuscous area extending hindmarginally to posterior angle by a narrow prolongation from below 2nd median nervule; subapical white bar oblique, continuous, consisting above subcostal nervure of three small elongate-cuneiform marks (of which the 1st and 2nd are situated nearer to base than the 3rd), and between subcostal nervure and 3rd median nervule of three much larger subrectangular divisions; a faint fuscous mark on disc between 1st median nervule and submedian nervure; fulvous-ochreous area paler externally; neuration (especially submedian nervure) black. *Hindwing*: fulvous-ochreous field much paler externally, and narrowly still paler along inner-margin; fuscous border commencing narrowly at apex, but widening on 1st subcostal nervule, thence moderately broad as far as 2nd median nervule where it abruptly narrows and whence it remains merely linear to anal angle; a small, almost linear, terminal disco-cellular fuscous spot, and a larger subcostal one beyond middle; in discoidal cell and beneath it the fuscous spots of the underside are faintly visible. Underside.—Hindwing and apical-hindmarginal border of forewing

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dull yellowish creamy, crossed by fine fuscous neuration; hindwing in basal area with 13 or 14 small whitish-ringed black spots. *Forewing*: fulvous-ochreous area as on upperside, and also fuscous area except beyond subapical white bar and along hindmargin—where (but for a narrow external edging to the bar) the fuscous is replaced by dull yellowish-creamy, the latter narrowing and becoming macular from lower radial to 1st median nervule. *Hindwing*: hindmarginal fuscous border very narrow, almost linear, throughout; the following small black spots (more or less imperfectly ringed with whitish scales), *vid.*: 1 at base; 1 close to base, between costal and subcostal nervules; a sub-basal transverse series of 3 (the middle one in discoidal cell) between costal and submedian nervures; 1 in discoidal cell near extremity; 2 (one above the other) on disco-cellular nervules; and a transverse series of 6, from costa beyond to submedian nervure before middle.

Head, thorax, and legs, black with white spots; antennæ and palpi black; abdomen creamy-ochreous-yellow, mixed with greyish on back and sides.

In the pattern of the upperside this *Mimacræa* has some resemblance to the type species from West Africa. *M. darwinia*, Butl. (Lep. Exot., pl. xxviii, fig. 8), but is easily distinguished by having the costal fuscous border in the forewing and the hindmarginal one of the hindwing very much narrower, and the subapical bar of the forewing pure-white instead of fulvous-ochreous. The underside of *M. darwinia* is not figured, but Dr. Butler notes it (*op. cit.*, p. 104), as being almost as in *Acræa cynthia*, Drury, so that it must be very widely different from that of *M. marshalli*. A very close ally of *M. darwinia* from Camaroon, *M. apicalis*, Smith and Kirby (Rhop. Exot., p. 41, Afr. Lyc. pl. x, figs. 6, 7, ♀—1890), is also an accurate mimicker of *Acræa cynthia* on the underside, but has a pale yellowish subapical bar in the forewing.*

This interesting species has all the aspect of an *Acræa*, but is not an exact mimicker of any species known to me, coming on the whole nearest to *A. encedon* (Linn.), but having a much brighter fulvous-ochreous field on the upperside, with the subapical bar in the forewing of a

* A very distinct species, *M. charmian*, Smith and Kirby (*op. cit.*, p. 42, figs. 8, 9), also from Camaroon, imitates (but less closely) *Planema elongata*, Butl. ♂.

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purer white, and differing also in the almost entire absence of black spots, except those on the underside of the hindwing near the base. In these respects *M. marshalli* somewhat resembles the ♀ of the type-form of *Planema esebria* (Hewits.), but on the underside, again, and on the abdomen, the colouring is much nearer to that of *Acræa encedon*.

The discoverer and captor, Mr. G. A. K. Marshall—after whom I have named this butterfly—informs me that he took the two specimens described and one other on the Mazoe River, in Mashunaland, near the end of December, 1894; they were flying very slowly along the edge of the bush at from six to ten feet from the ground. Notwithstanding their small size Mr. Marshall noticed that on the wing they bore much resemblance to *Danais chrysippus*, the colouring on the whole being closer to the aspect of this butterfly than to that of either *Acræa encedon* or *Planema esebria*.

Fam. HESPERIIDÆ.

Genus Pyrgus.

Pyrgus delagoæ, sp. n.

Allied to *P. sataspes*, Trim., and *P. zebra*, Butl.

Fuscous, with whitish spots. Forewing: in discoidal cell, rather beyond its middle, a moderate-sized rather narrow transverse spot; at extremity of cell a larger, subreniform spot; in discal series, the upper three spots are small and contiguous, forming a narrow subcostal transverse mark, but the lower three are larger (especially the middle one), separate from each other, and placed in an oblique row between third median nervule and submedian nervure; a sinuated submarginal series of seven very small spots; a series of very indistinct dots on hindmargin. *Hindwing*: median band represented by a rather wide central, subrectangular, somewhat oblique whitish marking, bounded by 2nd subcostal and 1st median nervules; only 4 very small spots in submarginal series, situated between the nervules just mentioned and very near hindmargin. Underside.—*Yellowish-brown; base and costa to beyond middle of forewing and base of hindwing closely irrorated with dull yellowish-white. Forewing*: lowest spot of discal series indistinct, geminate; spots in submarginal series better defined than on upperside, but hindmarginal dots wanting. *Hindwing*: no sub-basal white marking; median

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white stripe very sharply defined, unbroken, straight, and even almost from costa beyond middle to 2nd median nervule, whence it narrows to its junction with the inner-marginal greyish-white on submedian nervure not far from anal angle,—its external edge presenting slight dentations on nervules; submarginal series developed into a continuous strongly-festooned white line, with the effect of a row of small contiguous incomplete ocelli.

On the upperside there is but little to distinguish this *Pyrgus* from *P. sataspes*, but the small spots of the submarginal series are better defined, and in the hindwing the central whitish marking is broader. On the underside, however, the differences are considerable, *vid.*:—(1) the almost uniform tint of the ground-colour and the absence of the reddish tinge on hindwing and at apex of forewing presented by *P. sataspes*; (2) in the forewing the complete and rather conspicuous sinuate submarginal series of small whitish spots; while in the hindwing (3) there is no sub-basal white bar or streak; (4) the median bar is of a much purer white, begins on edge of costa instead of on costal nervure, is not constricted in the middle but of nearly even width till towards its inferior extremity; and (5) the submarginal series of spots—which is wanting in *P. sataspes*—is modified into the festooned hindmarginal border above described.

From the allied *P. zebra*, a native of the Punjab, the form here described differs much in the same way as from *P. sataspes*; but in *P. zebra* on the underside of the hindwing the median bar is considerably broader and less regular, and there is a white submarginal waved streak (much as in *P. ferox*, Wallgr.) instead of the regular festooned hindmarginal border.

It is remarkable that the last-named character occurs in both wings and in a more pronounced form in the otherwise very different and much larger European congener, *P. proto*, Esp.

I have seen only one example, taken by the Rev. H. Junod at Delagoa Bay, and sent to me for identification in June, 1897.

Plate I.

[*The explanation faces the* Plate.]

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II. *Some Results of Recent Experiments in Hybridising* Tephrosia bistortata *and* Tephrosia crepuscularia.

By James William Tutt, F.E.S.

[Read November 17th, 1897.]

The recent experiments made by Dr. Riding and Mr. Bacot in hybridising the two allied species, *Tephrosia bistortata*, Goeze (*crepuscularia*, auct.), and *Tephrosia crepuscularia*, Hb. (*biundularia*, auct.), and the interest caused by the exhibition of the specimens, has led to the expression of a wish that some permanent record of the results exhibited by the various broods should exist. This is my only excuse for this paper.

It is necessary to define the two species with which the experiments have been made, because it has been suggested that they really form but one species. The first, *Tephrosia bistortata*, is of an ochreous (often tending to ferruginous and fuscous) ground-colour; it occurs in the British Islands in March and again in July, is widely distributed in Scotland and the southern counties of England, and is found in the greater part of the Palæarctic and Nearctic regions. The second brood of this species differs from the first in being, usually, smaller, of a dead white colour and almost entirely without the ochreous tint of the first brood. The second species, *Tephrosia crepuscularia* (*biundularia*), has a white ground-colour; it occurs in the British Islands in May and June, that is, at a period intermediate between the two broods of *Tephrosia bistortata*, is never double-brooded, is widely distributed in Ireland, and the midland and northern counties of England, overlaps *T. bistortata* in the southern counties of England—in some cases occurring in the same woods, *e.g.*, near Swansea, Leigh Woods (Bristol), the New Forest, Reading, &c.,—occurs in central Europe, but is not known to occur either in southern or northern Europe, nor beyond European territory.

So far, then, the specific separation of these undoubtedly allied species is insisted upon by many specialists. The points urged by them are: (1) The differences in the

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eggs; (2) the differences in the general character and appearance of the imagines; (3) the difference in the shape of the wings, those of *T. crepuscularia* being much the squarer; (4) the independent life-histories of the two insects; (5) the constant difference in the times of appearance, even when inhabiting the same wood; (6) the fixed double-brooded habit of *T. bistortata*, the fixed single-brooded habit of *T. crepuscularia*; (7) the fact that the two insects breed true and always produce their own kind. On the other hand, those who maintain the specific identity of the species, do so on the ground that they are not able to refer with certainty occasional individual specimens to one or the other species. So far as the distinctness of two insects with perfectly independent and distinct life-cycles allows us to constitute them as separate species, these may be so considered.

Both species are subject to melanic variation. Melanic aberrations of *T. bistortata* are exceedingly rare, and almost confined to South Wales; on the other hand, melanic specimens of *T. crepuscularia* are very generally distributed in certain districts, such as Delamere Forest, Yorkshire, Mansfield (Notts), Derby, Swansea district (South Wales), &c. There is no district known where only the melanic form occurs, the typical form being regularly present in all localities in which it is taken. The melanic form of *T. crepuscularia* is known as ab. *delamerensis*, B.-White.

Dr. Riding's Experiments.

Origin of Parents used for Pairings.—By a little judicious artificial treatment during February and March, 1897, Dr. Riding obtained a pretty free emergence of *T. bistortata*, *T. crepuscularia* and *T.* ab. *delamerensis*. These insects were the parents of the hybrids and were obtained as follows:—

(1) *T. bistortata*.—These were (*a*) from eggs laid by a female of the second brood in July, 1896, and captured at Clevedon (Somerset), (*b*) eggs laid by female (second brood) bred by Mr. Bacot also from Clevedon ova. The imagines emerged between February 17th and March 27th, 1897. These were of the large, well-marked, ochreous, spring-form, known as ab. *abietaria*, Haw.

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(2) *T.* ab. *delamerensis.*—These were the imagines from pupæ bred from ova laid by a ♀ *T.* ab. *delamerensis*, captured in the York district. The eggs hatched May 30th–31st, 1896. Imagines of the typical form appeared with those of the melanic form from this batch of eggs; there were no real intermediates between the two forms; emergence took place between February 26th and April 27th (few came out before March 9th and some as late as April 27th).

(3) *T. crepuscularia.*—These were reared from ova of a female from the York district, the ova having hatched June 3rd–4th, 1896. The melanic form appeared w the type in almost equal proportions. The imagines emerged between March 7th and the end of the first week of April.

Selections from these three broods from which the parents were chosen, together with a brood of *Tephrosia bistortata* that emerged in July, 1897, to show the difference between this second brood and the first brood (*T.* ab. *abietaria*, Haw.) were exhibited at the meeting of the Ent. Soc. of London, Oct. 6th, 1897. The following are my notes on the specimens exhibited:—(1) *Tephrosia bistortata.*—From Clevedon (Somerset); those exhibited emerged between February 17th and March 8th, 1897. These are of the well-marked southern form, with suffused ochreous ground-colour, distinct basal and subterminal bands, and strongly shaded on either side of the wavy antemarginal line = ab. *abietaria*, Haw. 7 ♂ and 10 ♀. The latter more strongly banded and less suffused than the males.

(2) *T. bistortata* (second brood).—Progeny of specimens of the previously described brood; emerged between June 7th and June 24th, 1897. These exhibit the dead grey colour and ill-developed markings that characterise the second brood of the species, known as ab. *consonaria*, St. These are especially useful as showing the progeny of *T. bistortata*, uncrossed by *T. crepuscularia.*

(3) *T. crepuscularia.*—From York ova, bred between March 7th and the end of the first week of April. These are of a rather more suffused form than those from our southern woods; this is probably due to the influence of the melanism that has produced ab. *delamerensis*, a form that probably appears as a part of every brood in the York district whence these were obtained. The use of this

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rather suffused type form has complicated the colour difficulties in dealing with the hybrids, but has made them more interesting. 8 ♂ and 10 ♀.

(4) *T. crepuscularia* ab. *delamerensis*.—From York ova, bred between February 26th and April 27th, 1897. Blackish-grey in colour, deeply suffused but with irregular grey patches; the white antemarginal line not particularly strongly marked.

The broods marked 1, 3 and 4 are those from which the parents of the hybrids were selected.

Reciprocal Crossings obtained.—Fertile reciprocal crossings from 1, 3 and 4 broods (above), were obtained as follows:—

1.—*T. bistortata* ♂ × *T.* ab. *delamerensis* ♀.—*a*. Paired March 11th; ova deposited March 15th; hatched April 26th–27th.

2.—*T.* ab. *delamerensis* ♂ × *T. bistortata* ♀.—*a*. Paired March 9th; ova deposited March 14th; hatched April 18th–19th. *β*. Paired March 9th; ova deposited March 13th–14th; hatched April 18th–19th.

3.—*T. bistortata* ♂ × *T. crepuscularia* ♀.—*a* and *β*. Two pairings on March 17th; ova deposited March 20th–22nd; hatched April 25th–27th.

4.—*T. crepuscularia* ♂ × *T. bistortata* ♀.—*a*. Paired March 7th; ova deposited March 16th; hatched April 21st–22nd. *β*. Paired March 14th; ova deposited March 20th; hatched April 22nd–23rd.

Reciprocal crossings that failed were: (1) *T.* ab. *delamerensis* ♂ × *T. bistortata* ♀, two pairings—February 28th and March 12th. (2) *T. crepuscularia* ♂ × *T. bistortata* ♀, three pairings,—March 7th, March 10th, March 14th.

Hybrids.—I. *Hybrids between* ♂ *T. bistortata* (*Clevedon*) × ♀ *T.* ab. *delamerensis* (*York*).—No. 1 above. One batch of eggs; hatched April 26th–27th; 100 imagines examined; emerged between June 12th–October 22nd, 1897. These may be roughly divided as follows:—

3 ♂ 13 ♀	The males scarcely distinguishable from male *T. bistortata* of the second (summer) brood; the females much whiter and suggesting strongly typical ♀ *bistortata* of this brood by the clearness of the transverse lines.

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	2 ♀	These two females are very small, and would belong to the preceding set, but for the remarkable development (1) of the square spot about two-thirds towards the apex of the forewing and placed between the submarginal and marginal lines; (2) of the transverse bands, which suggest strongly a superficial likeness to *T. consonaria*, Hb. [See further notes on this form in Bacot's inbred series from Batch VI (p. 32).]
3 ♂		Bred June 18th, June 21st and June 24th. I am scarcely able to distinguish these from typical *T. crepuscularia*, they are rather more suffused, and hence tend to approach the set following.
15 ♂	4 ♀	These are remarkable. The ground colour is pale, but with much fuscous suffusion; strongly marked transverse lines, tending to form bands by shading within the basal and outside the median lines. They are totally unlike the southern *T. bistortata* ab. *abietaria* (the male parent) and *T. bistortata* ab. *consonaria* (the summer brood); superficially the paler ones are not very unlike *T. crepuscularia* (the York form). On the other hand, they are quite inseparable from Perthshire *T. bistortata*, which is a very specialised form of the species. They are much larger and broader winged insects than one ever obtains among *T. bistortata* ab. *consonaria*.
25 ♂	32 ♀	Uniformly suffused and practically ab. *delamerensis*. The males are darker (blackish-fuscous) than the females, with stronger transverse lines and a more or less clearly defined subterminal line; the females are uniform, grey-black in colour, with ill-defined markings, and here and there small irregular patches of the typical pale coloration.
2 ♂	1 ♀	The forewings approaching ab. *delamerensis*, the hindwings more or less typical; probably nearer *delamerensis* than any other form.
48 ♂	52 ♀	2 pupæ remained unemerged on November 10th, 1897.

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II. *Hybrids between* ♂ *T. crepuscularia* ab. *delamerensis* (*York*) and ♀ *T. bistortata* (*Clevedon*).—No. 2 above. Two batches of eggs; hatched April 18th–19th. The two broods were fed up together, the imagines being a mixture of both broods. 61 imagines examined, emerged between June 12th, 1897, and September 19th, 1897. They may be grouped as follows:—

22 ♂ — ♀	These are very close to ordinary second brood *T. bistortata*, but have the ground-colour rather more suffused than is usual in that form.
5 ♂	These are very like small *T. crepuscularia*, the tint and markings are almost identical with the Yorkshire specimens of this species.
4 ♂	These have the size and markings of the last set, but are ochreous, and tend in this respect to come nearer *T. bistortata* ab. *abietaria*.
2 ♂	Of the same fuscous suffused form as those described in the last crossing as resembling the Perthshire *T. bistortata*.
1 ♂	Larger and almost indistinguishable from the first brood of *T. bistortata*, the forewings rather less ample towards apex.
26 ♂ 1 ♀	These are of the ab. *delamerensis*, although some are more uniformly grey than the pure bred examples of this aberration. The dark transverse markings are very ill-defined, but the pale subterminal line is perhaps a shade more well-developed than in the specimens of last crossing. The single female of this brood is small, ill-developed, and has crippled wings.
60 ♂ 1 ♀	Complete brood; no pupæ going over.

The two crosses just summarised represent the reciprocal crosses of typical *Tephrosia bistortata* and *T. crepuscularia* ab. *delamerensis*. The following points are worthy of notice. I.—Percentage of a form approaching ab. *delamerensis* in the two crossings: (1) *T. bistortata* ♂ × *T.* ab. *delamerensis* ♀ = 60 per cent. (2) *T.* ab. *delamerensis* ♂ × *T. bistortata* ♀ = 40 per cent. II.—Percentage of females: (1) in 1st crossing = 52 per cent.; (2) In 2nd

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crossing = 1·64 per cent. III.—Percentage of the suffused form resembling Scotch *T. bistortata*: (1) In 1st crossing = 19 per cent.; (2) In 2nd crossing 3·3 per cent. IV.—The crossing in which *T. bistortata* was the male parent has produced by far the larger and more vigorous-looking offspring.

III. *Hybrids between ♂ T. bistortata (Clevedon) and ♀ T. crepuscularia (York).*—No. 3 above. Two batches of eggs; hatched April 25th–27th; larvæ fed up together; 121 imagines examined, emerged between June 17th and November 3rd, 1897. These may be grouped as follows:—

1 ♂ 42 ♀	These are pale specimens, resembling the second brood of *T. bistortata* in their small size, but distinctly of a cleaner white, thus approaching the ground-colour of *T. crepuscularia*, and with the fine median transverse shade or line, between the elbowed and basal lines (observable in the York *T. crepuscularia*, but practically obsolete in the Clevedon *T. bistortata*). They also show a tendency to form, by means of darker shading outside the elbowed line and within the basal line, transverse bands.
61 ♂ 9 ♀	These, the bulk of the specimens, have the ground-colour much suffused with fuscous and the transverse lines and shades distinct, resembling closely the Perthshire *T. bistortata*; the earlier emerged specimens of this form are smaller and lighter, the later larger and darker.
3 ♂ 5 ♀	These closely resemble small specimens of the early brood of *T. bistortata*, although one sees none like them in nature. They are as strongly marked as the last, but suffused deeply with ochreous instead of fuscous.
65 ♂ 56 ♀	Two emerged October 31st and November 3rd. Complete brood; no pupæ going over.

IV. *Hybrid between ♂ T. crepuscularia (York) × ♀ T. bistortata (Clevedon).*—No. 4 above. Two batches of eggs; hatched April 21st–23rd; larvæ fed up together; 40 imagines examined; emerged between June 16th

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and November 1st, 1897. These may be grouped as follows:—

9 ♂ — ♀	These are small dull grey males with the ground-colour much suffused as in the pale males of crossing II. One is inclined to say that they have a slaty hue. The marks are ill-defined, since they merge into the darkish ground-colour. They resemble the second brood of *T. bistortata* in the absence of definite markings and general suffused appearance; they approach *T. crepuscularia* in the squarer forewings. These emerged chiefly in June.
3 ♂	Small; ground-colour strongly suffused with ochreous; transverse markings moderately distinct.
28 ♂	Rather larger, and fuller winged than the pale specimens. Of the form with the ground-colour suffused with fuscous. These larger, darker and more strongly marked specimens were the last to emerge, chiefly in late September and October; two as late as October 30th and November 1st respectively.
40 ♂ — ♀	5 pupæ going over on November 10th, 1897.

The two last crosses enumerated represent the reciprocal crosses of typical *T. bistortata* and *T. crepuscularia*. The following points are noticeable. I. Cross with *T. bistortata* as ♂ parent produced 47 per cent. females. The cross with *T. crepuscularia* as ♂ parent produced no females. II. In both crossings the earliest specimens to emerge were much the palest. These were females in the first case, males in the second. The ochreous specimens were those that were intermediate in the pupal state; the darkest, largest, most strongly marked and most vigorous-looking were much longer in the pupal stage.

Mr. Bacot's Experiments.

Origin of Parents used for Pairings.—These were from the same localities as those used by Dr. Riding, *viz.*, Clevedon (Somerset) for *T. bistortata* and York district for *T. crepuscularia*.

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RECIPROCAL CROSSINGS OBTAINED.—Fertile reciprocal crossings obtained were:—

1.—*T. bistortata* ♂ × *T.* ab. *delamerensis* ♀.—Paired March 9th.

2.—*T.* ab. *delamerensis* ♂ × *T. bistortata* ♀.—Three pairings. *α.* Paired February 26th; ova deposited April 6th. *β.* Paired March 5th. *γ.* Paired March 9th; ova deposited April 7th.

3.—*T. bistortata* ♂ × *T. crepuscularia* ♀.—Two pairings. *α.* Paired March 9th; hatched April 8th–9th. *β.* Paired March 9th; hatched April 8th–9th.

4.—*T. crepuscularia* ♂ × *T. bistortata* ♀.—Paired February 27th.

Crossings that failed were: (1) *T. crepuscularia* ♂ × *T. bistortata* ♀. Paired February 27th. (2) *T.* ab. *delamerensis* ♂ × *T. bistortata* ♀. Paired March 4th.

HYBRIDS.—I. *Hybrids between* ♂ *T. bistortata* × ♀ *T.* ab. *delamerensis.* [Ova received from Dr. Riding.]—They are part of Dr. Riding's cross marked I, eggs laid March 15th, hatched April 26th–27th. Examined 21 specimens = 11 males, 10 females.

4 ♂ 4 ♀	The males dead grey, not ochreous, fairly well marked, showing the more definite markings of *T. bistortata*; the females are almost pure white with the fuscous lines distinct, but the transverse shading usually united with them almost obsolete.
7 ♂ 6 ♀	These may be classed as ab. *delamerensis* although six males only carry the dark ground-colour of this form; one of the males, and two of the females uniform dull grey (-black), weakly developed, almost without markings, and with a tendency to be diaphanous; the remaining four females, saved for eggs, are worn, but were evidently of the same type. [This ill-developed form of ab. *delamerensis* is undoubtedly due to the crossing, the rapid feeding of the larva, and the production of a second brood, a phenomenon never occurring in nature. The other portion of this brood shows the same peculiarities in a rather less marked degree.]
11 ♂ 10 ♀	

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II. *Hybrids between* ♂ *T.* ab. *delamerensis* × ♀ *T bistortata.*—No. 2*a* above. One batch of eggs hatched April 6th; some larvæ full-fed by May 9th; larvæ mostly like that of the ♀ parent (*bistortata*) only a few having the apex of the ∧ open like the larva of *T. crepuscularia.* Most of the larvæ pupated about the middle of May. Imagines commenced to emerge early in June, at first rapidly and afterwards more slowly until the end of June; there was then a break until July 16th, when they again commenced to emerge and continued to do so at intervals until the first week in September; one specimen emerged during the last week in October. 58 specimens examined all males—29 pale and 29 dark specimens.

18 ♂ —♀	Of a cold grey colour, near (but whiter than) the normal second brood of *T. bistortata*, just showing the dull grey suffusion so characteristic of Yorkshire *T. crepuscularia*; the transverse markings and shades well developed.
11 ♂ —♀	Having the same well-marked characters as the last, but strongly suffused with ochreous.
29 ♂	The ground-colour of an uniformly cold steely grey, only two showing a suspicion of a warmer brown tone, otherwise uniformly dark like ab. *delamerensis*; the darker transverse lines and shades obsolete, the whitish subterminal line moderately developed but not conspicuous; irregular grey patches and streaks on all the wings.
58 ♂ —♀	1 pupa unemerged on November 16th.

This brood is most uniform in size, rather larger than is usual in second-brooded *T. bistortata.* There is a very strong, albeit almost indefinable, suspicion of both parents in every specimen, due perhaps to the general tendency towards a slight lengthening of the wings, a tendency to ochreous in some, the running of the markings into transverse bands, all characters of *T. bistortata*; whilst the whiter ground colour, the defined character of the square spots (one at the lower end of the discoidal cell, the other on the submarginal line) tend towards *T. crepuscularia*, and taking the brood as a whole it distinctly leans towards the latter. Few of these emerged late, but these are the

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most ochreous. Comparison with Dr. Riding's parallel (II) cross, many of which were much longer in the pupal stage, is instructive.

III. *Hybrids between ♂ T. bistortata × ♀ T. crepuscularia.*—Of this cross there were two different broods. Of the first (*a*), marked 3*a* in Bacot's pairings, the larvæ for the most part followed the ♂ parent (*bistortata*), only a few have the apex of the ∧ mark open as in the ♀ parent; full-fed from about May 16th–20th. 22 specimens examined—14 ♂ and 8 ♀. These emerged in June with the exception of two which came out in July.

14 ♂ 8 ♀	These are an exceedingly uniform batch, the superficial resemblance to second brood *T. bistortata* being very marked. The sexual dimorphism marked; the females whiter, clearer, and less mottled than the males. There is a distinct absence of ochreous and a tendency to the suffusion noticeable in pure-bred Yorks. *T. crepuscularia.* [None of these emerged late, and none shows any tendency to become dark.]
14 ♂ 8 ♀	

β. (♂ *T. bistortata* × ♀ *T. crepuscularia.*)—Of the other brood of this cross (marked 3*β*), a fair number of the larvæ fed up and pupated very quickly, but others fed up slowly and did not go down until the earliest specimens had commenced to emerge; larvæ unhealthy, a large proportion died. I examined 9 specimens—6 males and 3 females. Four minute specimens—$\frac{15}{16}$″(♂), $\frac{15}{16}$″(2 ♀), 1$\frac{1}{8}$″(1 ♀). These small specimens emerged in late June, two normal specimens in early July, one on September 29th, and two late in October.

1 ♂ 3 ♀	These are pale and practically without markings, although faint traces of the various lines can be seen in 1 ♂ and 1 ♀; the second small ♀ with hindwings crippled; these three specimens measure only $\frac{15}{16}$″ in expanse. The other ♀ is also a pigmy, but fuller winged and better marked, being 1$\frac{1}{8}$″ in expanse.

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3 ♂		Normal size of second-brood *T. bistortata*; ground-colour distinctly ochreous in tint; strongly developed transverse markings. Two of these were October emergences.
2 ♂		Much suffused with fuscous; strongly marked, small, size of second-brood *T. bistortata*; one emerged July the other September 29th; the only two of Bacot's insects yet examined that approach the Scotch *bistortata* form.
6 ♂	3 ♀	

It may be well to mention here that these tiny specimens are not infrequent in inbred *T. bistortata*. Such a brood as this last is practically useless for comparative purposes.

Specimens bred by Mr. Prout.

III. *Hybrid between* ♂ *T. bistortata* (*Clevedon*) × ♀ *T. crepuscularia* (*York*).—One batch of eggs; 15 imagines examined, emerged from June–August, except one specimen, which emerged September 26th; no pupæ going over the winter.

1 ♂	3 ♀	Pale, differing but little from summer *T. bistortata* except that the females are poorly marked, the transverse bands being ill-developed.
3 ♂	5 ♀	Pale, with the square spot (noted in Batch I of Dr. Riding's crosses, and Batch VI *a* and *β* of Mr. Bacot's) well developed; females paler than males.
3 ♂		Suffused with the ochreous tint of *T. bistortata* early brood; more strongly marked. These were the last to emerge, two in August, and one on September 26th. The last is the most strongly marked specimen of the brood.
7 ♂	8 ♀	Complete brood; no pupæ going over.

Dr. Riding's Experiments (*Continued*).

Besides obtaining reciprocal crossings of the parent species, pairings of the hybrids were obtained by Dr. Riding, between June 13th and 26th as follows:—(1) ♂

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(♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*). (2) ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). (3) ♂ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). (4) ♂ (♂ *T. crepuscularia* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). (5) ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. crepuscularia* × ♀ *T. bistortata*). Of these different crosses, twelve pairings in all were obtained, eleven of which gave ova, and yet of these eleven batches only two were fertile, both crosses of ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). The progeny resulting from these two batches are summarised later in this paper (*vide*, V). Later pairings of ♂ (♂ *T. crepuscularia* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*) also proved infertile. Dr. Riding, however, obtained four inbred pairings of ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*); one of these produced no eggs, another was infertile, the two others were only partially fertile.

V. Second Generation of Hybrids.—♂ (♂ ab. *delamerensis* × ♀ *bistortata*) paired with ♀ (♂ *bistortata* × ♀ ab. *delamerensis*).—The parents taken from crossings II, and I above respectively. Two batches of eggs, hatched June 27th–30th; 44 imagines examined; emerged between August 21st and November 3rd, 1897. It is almost impossible to classify these. As an approximation the following table is appended.

8 ♂	1 ♀	Most nearly approaching to *T.* ab. *delamerensis*, but with the exception of their tendency to unicolorous suffusion very different therefrom.
2 ♂		Of a slaty-grey tint, approaching the hue of *Boarmia gemmaria*.
4 ♂		Not unlike pale second-brood specimens of *T. bistortata*.
2 ♂		Dark fuscous, well-marked, closely resembling *T. bistortata* from Perthshire.
3 ♂	1 ♀	Closely resembling typical Yorkshire *T. crepuscularia*.

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18 ♂	3 ♀	I am obliged to term these "intermediates," as they will not fall into any of the above divisions. They are moderately well-marked and might be looked upon if found in nature as odd aberrations of either species. Needless to say, such forms do not to my knowledge occur in nature.*
	2 ♀	Unclassified. Quite distinct from anything that I have ever seen.
37 ♂	7 ♀	One emergence on November 4th; 14 pupæ still left on November 10th, 1897.

VI. Inbred Hybrids.—♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). —From two batches of eggs:—(1) Paired August 10th; ova laid August 12th; hatched during the fourth week of August, some only fertile: (2) Paired August 13th; ova laid August 15th; hatched first week in September. By October 22nd all except 13 larvæ had pupated. The first two imagines emerged on November 4th, fine full-fed larvæ at that date not having gone down. 5 specimens examined, 3 ♂ and 2 ♀; emerged between November 4th and 10th.

2 ♂	2 ♀	These are again perfect intermediates between *T. bistortata* ab. *consonaria* and *T. crepuscularia*. The larger size of the ♀, the uniform grey tint, the ill-defined markings all lean to the former, whilst the squarer wings approach the latter.
1 ♂		Of a cleaner and better marked type. Difficult to place, but certainly more nearly approaching *T. crepuscularia*.
3 ♂	2 ♀	The brood only just commencing to appear.

This cross is similar to the two which follow, but two months later. They are not so very dissimilar from the first section (12 ♂ 1 ♀) of Bacot's Batch VI, but very different from the 9 ♀ specially described.

* I use the term "intermediate" simply to include those specimens in which the characters of both parents are more or less defined without any very strong tendency towards either.

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MR. BACOT'S EXPERIMENTS (*Continued*).

In addition to the first crosses already summarised, Mr. Bacot obtained the following more or less fertile crossings of the various hybrids reared from the already-described broods.

(1). ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). Two pairings: *a.* June 10th. *β.* August 6th.

(2). ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). Two pairings on June 10th. (Eggs mostly infertile.)

(3). ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. bistortata* × *T.* ab. *delamerensis*). Paired June 11th.

He further obtained the following inbred pairings.

(4). ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). Four pairings: *a.* June 10th. *β.* June 10th. *γ.* June 14th. *δ.* June 17th. (A large percentage of the eggs infertile.)

(5). ♂ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). One pairing, June 13th.

The following pairings of a hybrid with one of the parent species were also obtained :—

(6). ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ *T. bistortata* (second brood). Paired June 15th. Only one or two ova hatched, remainder infertile.

(7). ♂ *T. crepuscularia* (second brood) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). Paired July 4th.

The following crosses entirely failed :—(1) ♂ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*). Paired June 12th. (2) ♂ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*). Paired June 14th. (3) ♂ (♂ *T.* ab. *delamerensis* × ♀ *T. bistortata*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*).

VI.—INBRED HYBRIDS.—*a.* ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (*T. bistortata* ♂ × *T. crepuscularia* ♀).—Both parents came from Mr. Bacot's Batch III*a*. The parents are normal for that brood. Pairing took place June 17th, 1897; 22 imagines examined, 12 ♂ and 10 ♀ ; these emerged between the middle of August and end of October.

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12 ♂ 1 ♀ | The brood from which the parents were selected was remarkably free from any ochreous tint, the two selected as parents for this brood being absolutely without a trace. These 12 ♂ and 1 ♀ are of the same well-marked type as the parent form; the males, however, ochreous, more suffused in colour, and rather smaller. The later emerging males are darker than those which emerged first. The female is white, with distinct transverse lines and bands, and the shape of the wings is particularly *bistortata*-like.

9 ♀ | These bear no resemblance to either parent, nor to either species from which derived. Five of the specimens are of a clear white ground-colour, and five are tinged with ochreous. The former have the base and centre of the wings with only the faintest traces of the transverse markings; these are rather more evident (though still inconspicuous) in the others. The specimens all agree in having the inner part of the normally pale submarginal line of the fore- and hind-wings conspicuously white (as in well marked ab. *delamerensis*), edged internally with a very dark, blackish-fuscous line, which develops a conspicuous costal blotch and a very distinct, dark, square spot (about a third down from the apex) on the forewing, reaching to the fringe. This gives the specimens a distinct resemblance to ♀ *T. consonaria*, but, in the latter, the square spot is most strikingly developed in the elbowed, and not on the submarginal, line. The same spots are clearly traceable in *T. bistortata* and *T. crepuscularia*, but never show up conspicuously as in these specimens. The hindwing is similarly marked with a conspicuous antemarginal band. One is much reminded of the dark band of *Acidalia trigeminata*, but in that species it is the elbowed, and not the antemarginal, line that is affected.

12 ♂ 10 ♀ |

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β. ♂ (♂ *T. bistortata* × ♀ *T. crepuscularia*) × ♀ (♂ *T. bistortata* × ♀ *T. crepuscularia*).—Another brood, the male and female parents of which were selected from the same batch as the last (Bacot's Batch, III, *a*). The parents also were normal for that brood. Eight imagines examined, 4 ♂ and 4 ♀; emerged from August until end of October.

4 ♂	1 ♀	Males small, the female larger. As in the last brood, a tendency to ochreous. The female well marked. The last two males to emerge more suffused than the two earlier ones; one very late tending to the fuscous (Perth) form. Otherwise not unlike second-brooded *T. bistortata*.
	3 ♀	Of the same form as the nine females described in the last brood, but with the peculiar band-like appearance less strongly defined.
4 ♂	4 ♀	

VII. ♂ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*).—The parents of this brood were both taken from Bacot's Batch I. They paired on June 13th, and produced in September only two small, round-winged imagines—1 ♂ (1⅛ in. in expanse) suffused with ochreous-fuscous and with distinct transverse lines; 1 ♀ (1¼ in. in expanse), whitish ground-colour, with basal and median bands, and well-developed submarginal lines to forewings, and median and outer bands to hindwings. Both specimens show traces of a fine, black, longitudinal line on median nervure at outer point of discoidal cell, and a small, black costal blotch at upper end of the basal line. [This latter is most marked in two males of *T. crepuscularia* (second brood) bred by Mr. Bacot.]

VIII. Hybrid crossed with ♂ of Parent Race.—♂ *T. crepuscularia* (second brood) × ♀ (♂ *T. bistortata* × ♀ *T.* ab. *delamerensis*).—The progeny is, therefore, three-fourths *T. crepuscularia* and one-fourth *T. bistortata*. The female hybrid chosen for this experiment was of the *delamerensis* form and taken from Bacot's Batch I. Pairing took place on July 4th. Forty-nine imagines resulted and

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were examined; 38 ♂ and 11 ♀. These emerged during September and October. Only 2 ♀ were present among the first 37 emergences and 9 among the last 12. These consisted of 31 pale and 18 dark specimens.

22 ♂ 2 ♂	Considerable ochreous suffusion in ground-colour, otherwise these specimens have quite reverted to *T. crepuscularia* and are of normal size for that species. One is darker fuscous and tends rather to the *bistortata* facies.
7 ♀	Larger (with exception of one specimen) than males of this brood; well marked females of distinct *T. bistortata* type, but with a suspicion of the whiter ground-colour of *T. crepuscularia*. [The important factor relating to these females is that these specimens were longest in pupa, and show a tendency to be larger, a common sexual difference in *T. bistortata* in nature, but not in *T. crepuscularia*.]
16 ♂ 2 ♀	These are of the *T.* ab. *delamerensis* form, and are practically inseparable from those of the ♀ parent brood, except that they are more mottled with irregular patches of white.
38 ♂ 11 ♀	

With the exception of the 7 females separated from the others above, the remainder of this brood are, to all intents and purposes, *T. crepuscularia*. Only one who had made a very special study of these could tell that the latter had been crossed with *T. bistortata*.

This completes my summary of the various broods that I have examined. The comparisons of the different crosses have been made with: (1) Typical *T. bistortata* of the first and second broods, bred from Clevedon ova; *T. crepuscularia*, and *T.* ab. *delamerensis* bred from York ova by Dr. Riding. (2) Three second-brood examples of *T. crepuscularia* (parents of York origin) bred by Mr. Bacot (only five individuals of this brood are positively known to have occurred in England). (3) Some 200 wild specimens (or specimens bred from wild parents) of *T. bistortata* and about 150 of *T. crepuscularia* and *T.* ab.

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delamerensis from various Scotch, Irish, Welsh and English localities in my own collection.

I have, as much as possible, neglected the use of the term "intermediate." It appears to me that it is frequently most carelessly used, and, as generally applied, comprises almost anything from a sort of "piebald" mixture, so to speak, of two species, to the general resemblance a hybrid must bear to both parents, according as we study them from the point of view of one or other of the parents. All the hybrids dealt with in this paper are, with here and there an exception, in varying degrees, intermediates, *i.e.*, almost every specimen appeals, in some part of its facies, to a specialist as resembling *T. bistortata*, whilst the same specimen, in other particulars, strikes one as resembling *T. crepuscularia*. Even the (approximately) black specimens, which, from their striking coloration, naturally most conceal any approach to *T. bistortata*, are distinctly modified in general appearance and wing structure, and show a tendency to the more marked sexual differences apparent in wild *T. bistortata*. There is also another difficulty which the introduction of *T.* ab. *delamerensis* has caused. In nature, specimens of this aberration are frequently marked with irregular patches of white on all, or some, of the wings (they are "piebald" so to speak), and this may well result from the crossing of the type form with its aberration, for, occasionally, the hindwings are of the typical, and the forewings of the same specimen of the melanic, form. This "piebald" condition is very marked in some of the hybrids classed as *delamerensis*, and this increased "piebald" condition may be the result of hybridity, although one hesitates to say it is so. The ground-colour of the ab. *delamerensis* so-called, which occurs among the hybrids, is of a much more uniform grey (especially in the females), the scales ill-developed, the markings weak or obsolete, and the size small, in almost all individuals that emerged quickly as a second brood. These features are undoubtedly referable to the hybridisation which has brought about rapid maturity, the hybrid larvæ feeding up rapidly as do those of *T. bistortata*, producing a second brood, a phenomenon practically unknown in nature in *T. crepuscularia*. It may, therefore, be looked upon as the influence of *T. bistortata* on the hybrids, since the second brood of this species is characterised by small size, ill-developed mark-

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ings, and weak colour. It has been deemed advisable, however, to classify these specimens as ab. *delamerensis*.

The conclusions to which these experiments point may be briefly summarised as follows:—

1. The intercrossing of the two species may result in every possible intermediate stage of fertility, from complete sterility to the production of the full number of fertilised eggs. These extreme results may even happen when dealing with different individuals of the same brood. [Failure, therefore, in a few individual cases must not be taken as proving that any particular cross is infertile. Individual aberration of the genital organs may lead to failure; one of Dr. Riding's failures happened with a pair that remained *in copulâ* two days and then had to be forcibly separated; this probably was due to such an aberration.]

2. Certain crossings produced almost entirely male offspring. [These were (a) the cross *T.* ab. *delamerensis* ♂ × *T. bistortata* ♀. Of *two* broods of this crossing, the larvæ of which were mixed, Dr. Riding obtained 60 males and but 1 ill-developed female. A cross of the same two forms, as male and female parent respectively, by Mr. Bacot produced 58 males and no female. It would have been easy here, had Dr. Riding's one ill-developed female not emerged, to have assumed that this cross would produce only male progeny. (b). The cross in which *T. crepuscularia* ♂ was paired with *T. bistortata* ♀ produced in Dr. Riding's hands 38 males and not a single female. It is worthy of note that these were the only four fertile crosses obtained in which *T. crepuscularia* was the male parent.]

3. The hybrids are fertile *inter se* but to a less extent than in the parent stock, *i.e.*, there appears to be a larger proportion of failures. They are also fertile with the parent stock. [The former part of this conclusion has been amply proved by both Dr. Riding and Mr. Bacot. The latter was proved by Mr. Bacot successfully crossing a ♀ *T. bistortata* × *delamerensis* with a ♂ *T. crepuscularia*. One might have expected that if the males of a hybrid were capable of fertile union with females of either parent species as shown by Standfuss, that a certain percentage of the females should be so, and probably also with each other. The number of specimens at the disposal of Dr. Riding and Mr. Bacot has made their experiments particularly useful, as it allowed for a large

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number of failures to take place, and yet ultimately for success to be obtained.]

4. The direct hereditary influence exerted by the parents is a great one. [In every case in which one of the parents was a *T.* ab. *delamerensis*, there was a large percentage of specimens of, or approaching, this form in the progeny, and this in spite of my opinion on other grounds that *T. bistortata* is the phylogenetically older and predominant species. In no case in which typical *T. crepuscularia* was used as a parent were any forms approaching *delamerensis* produced, although the parent was from a brood producing both the typical and melanic forms.]

5. The older species phylogenetically is more dominant in stamping its characters on the progeny. [This is probably the same as Standfuss's statement that the phylogenetically older of the parent species is prepotent. My view is abundantly proved by the extent of approximation (leaving out the direct influence of the ab. *delamerensis* form) towards *T. bistortata* in almost all the broods. This approximation is more especially striking in the large broods of Dr. Riding, in which *delamerensis* does not enter as a disturbing influence. If, as is here assumed, and afterwards attempted to be proved, *T. bistortata* is phylogenetically a much older species than *T. crepuscularia*, it is evident that the phylogenetically older parent leaves more mark on the offspring. It may be, of course, that *T. bistortata* is a predominant species, more active in its vital functions, and more ready to respond to environmental influences, although the variation of *T. crepuscularia* renders the latter scarcely probable. At any rate, the dominating influence of *T. bistortata* on the progeny is most marked.]

6. The sex-condition of the hybrids depends on the predominating influence exerted by one of the parents. [In the reciprocal pairing in which *T. bistortata* is the male parent, a fair share of females is the result; when *T. crepuscularia* is the male parent the females are practically wanting. This suggests also that the male exerts the greater influence in the production of female progeny and *vice versâ*.]

7. A recently formed aberration may be prepotent and dominant over the type from which it has but recently sprung. [This conclusion appears somewhat paradoxical in the face of 5, yet it is evident from these crosses that,

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whereas *T. bistortata* is the more dominant of the two species, *T.* ab. *delamerensis* is dominant over typical *T. crepuscularia*. In cases in which ab. *delamerensis* is used as a parent, the number of individuals of, or approaching to, this form is rarely less than 50 per cent. In all cases where typical *T. crepuscularia* has been used its influence has been almost extinguished by that of *T. bistortata*. This may probably be explained by the fact that at the present time *T.* ab. *delamerensis* is in rapid process of specialisation in its colour development, and that this activity is maintained in the crosses; or it may be explained as following the ordinary laws of natural selection, if it be conceded that variation is important to the existence of the species, since it is simply the survival of the fittest locally. This conclusion does not, then, necessarily conflict with the fact that the phylogenetically older form, which has survived as the fitter over large areas for a long period, is more potent].

8. The re-crossing of a hybrid with one of the parent species, produces offspring scarcely differing from the parent species with which the hybrid has been paired. [This conclusion is weak, so far as it is based only on a fairly large brood (49 specimens) bred by Mr. Bacot by pairing a dark ♀ hybrid (♂ *T. bistortata* × *T.* ab. *delamerensis*) with a ♂ *T. crepuscularia* (second brood). These are, therefore, three-fourths *T. crepuscularia* and one-fourth *T. bistortata*; the connexion of the latter species is only evident in a tendency to ochreous in the ground-colour of the males, although the latest emergences (7) of the females show very distinctly the *T. bistortata* cross. With the exception of the slight change in ground-colour, all the other specimens are practically indistinguishable from typical *T. crepuscularia*.]

9. The inbreeding of the hybrids of the same cross with each other produces a large percentage of individuals differing much from either parent form. [The form frequently produced by this cross has already been described and compared with female *T. consonaria*, which it superficially resembles in some respects. The same form, but of a rather less pronounced type, occurs occasionally in first crosses.]

10. The crossing of the hybrids obtained from original reciprocal crosses tends to produce a mixed progeny, some referable to known forms of the crossed species, others

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quite unlike anything ever obtained in nature. [This is very evident in Dr. Riding's double brood of ♂ hybr. *delamerensis-bistortata* × ♀ hybr. *bistortata-delamerensis.* I consider this and Mr. Bacot's inbred hybrids in many ways the most important crosses of all, for they prove absolutely that the species operated on are really distinct. If, as has been stated, these were simply two racial forms of the same species, with independent life-histories, existing side by side in the same districts, these crosses should have produced one or other of the parent form (or the parent form if both are identical). The production of forms quite unknown in nature by crossing would be quite inexplicable if the species were in any way identical. These experiments support Eimer's view that sexual combination can lead to the production of new forms. I doubt, however, very much whether they could be perpetuated without selection, and should such a cross occur in nature, it would in my opinion (*ante*, p. 38, par. 8) revert at once if crossed with one of the parent species, and isolation and selection would both have to be carried out for the perpetuation of the new form.]

11. The darkest, best-marked, largest and most vigorous specimens are those which remain longest in the pupal state. [The fact of the females being normally paler than the males in both parent species, suggests that they have less energy (and material) at disposal for pigment-formation than have the males, more energy being required for the formation of the ova. When small and of a very pale form, the females are the first to emerge (see Riding, Batch II.), the males following on quickly; on the other hand, when they are larger, darker, and more vigorous, they emerge after the males (*vide* Bacot, Batch VIII.). As a rule, it may be taken that the size, vigour, and depth of colour are almost directly proportional to the length of pupal life. The gradation in colour (apart from ab. *delamerensis*) in some of the broods is most remarkable. The very late emerging specimens in Dr. Riding's Batches III. and IV., have resulted in the production of specimens quite different in hue from the colours reached by the parent species, either at Clevedon or York.]

12. The hybrids have lost all regularity as to the time of emergence, *i.e.*, hybridity causes continuous-broodedness. [All the crosses result in producing progeny which

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pair and in turn produce progeny, and so on *ad. inf.* Even the *T. crepuscularia*, one of the most regularly single-brooded species in England (only five undoubted second-brood specimens are known) are unable to prevent this. Broods of almost all the crosses are now feeding, and in one case, at least, larvæ of hybrids of the third generation. Allowance must of course be made for the tendency of the prepotent *T. bistortata* to be double-brooded (and that it will occasionally also produce an individual or so of a third brood), but these broods emerge almost entirely and appear capable of going on indefinitely if food be provided. The same tendency is observable in hybrid *Smerinthus populi-ocellatus*, both parents of which are normally single-brooded species, but the hybrids from which always emerge in autumn as a second brood (*vide Ent. Record*, I, pp. 202–203, where Kirk gives:—Pairing May 31st, 1890; larvæ pupated July 20–27th; ten imagines bred after being in pupa three weeks; normal *S. ocellatus* and *S. populi* fed up side by side going over the winter). It is also observable in hybrid *Amphidasys strataria-betularia*, both of which parents are absolutely single-brooded (*vide Ent. Record*, II, p. 83, where Dr. Chapman records a ♂ *A. strataria* paired with a ♀ *A. betularia* ab. *doubledayaria*; fertile eggs produced; larvæ fed up on sallow and oak; half-a-dozen larvæ missed a moult and pupated early; emerged some time during winter (as they were found dead in spring).]

The following general observations have also been noted in my examination of the insects:—

The influence of the male parent is less than that of the female, as shown by the percentages of *T.* ab. *delamerensis*, but this varies with individual broods.

When *T. bistortata* is the male parent, the progeny is more vigorous than when *T. crepuscularia* is the male parent.

The greater vigour of the male results largely in the production of female offspring. When the male is of the dominant species, females are developed in fair proportion; when the female is of the predominant species, males are largely in excess.

The hybrid facies of all the first crosses, and the ease (judged from the one large brood at disposal) with which the progeny of first crosses revert to one or other of the parent forms, when crossed therewith (even when

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that form is the younger phylogenetically and therefore less prepotent), suggests very strongly that the insects under consideration are true and distinct species. It also shows that if, accidental hybridisation took place in nature, the progeny of the hybrids thus produced would, if such hybrids paired with either parent species, lose its separate identity and merge at once into that parent species with which it crossed. Although possible, it appears very improbable that any lepidopterous hybrids would in nature continue their race apart, and this, not from any want of vigour, but from want of sufficient isolation. Given the latter, then it is quite possible that they should do so. It must not be overlooked that the continuous-brooded element introduced into their habits would also tend to their destruction, as the eggs laid during October and November would hatch and the larvæ perish from want of food.

The tendency for all the late-emerging specimens to be entirely different from either (1) the Clevedon spring form of *T. bistortata* (=ab. *abietaria*, Haw.), (2) the Clevedon summer form of *T. bistortata* (=ab. *consonaria*, St.), (3) the typical Yorkshire form of *T. crepuscularia*, or (4) the *T.* ab. *delamerensis*, and to develop a form identical with the Perthshire *T. bistortata*, a form that does not occur in England, but which closely resembles that found on the Continent, in certain Asiatic portions of the Palæarctic region, and in the Nearctic region, suggests most strongly that the Perth form is, so far as the forms occurring in Britain are concerned, the natural type form of the species. This vast distribution of *T. bistortata*, when compared with the restricted range of *T. crepuscularia* (so far as it is known), strongly supports the view that *T. bistortata* is the older species phylogenetically.

As bearing out No. 12 of my conclusions, Dr. Riding remarks: "The fact of all the insects taking after *Tephrosia bistortata* in habits, *i.e.*, in a second and even third (second generation of hybrids) emergence in the same year, is remarkable. Virtually, none takes after *T. crepuscularia* and *T.* ab. *delamerensis* in this respect. The environment and captivity cannot have anything to do with causation, as I have pupæ of both these latter and of Perth *T. bistortata*—bred more or less about the same time and under the same conditions—all going over the winter as pupæ."

Dr Riding further adds: "It may be well to note the

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similarity of the single specimen of *T. bistortata* that is exhibited and that emerged as the representative of a third brood on August 17th, 1896, to a small *T. crepuscularia*, though the rest of the pupæ of the brood that went over the winter emerged as typical *T. bistortata* in 1897."

Mr. Bacot has given me the following interesting information on the early stages:—

(1) The ova of *T. bistortata* are considerably larger than those of *T. crepuscularia*. The ova of all the hybrids examined approach more nearly in size to those of *T. crepuscularia*, in some cases being somewhat smaller. Dr. Riding gives the relative sizes of the ova as—*T. bistortata* (1st brood): *T. bistortata* (2nd brood); *T. crepuscularia*: ovum of hybrids :: 4·25 : 3·75 : 3·5 : 3.

(2) The hybrid larvæ feed up more rapidly than those of either parent species.

(3) There is a slight tendency for the hybrid larvæ to follow the larval form of the female parent; at the same time, there is a much more strongly marked tendency for the larvæ of all the crosses to follow the larva of *T. bistortata, i.e.*, that whilst the larvæ of all the crosses are very close to those of *T. bistortata*, as regards the dark united ⋀, a larger proportion of the cross ♀ *T. crepuscularia* × ♂ *T. bistortata* tends to have a distinct gap at the apex than is the case with the reciprocal cross.

(4) In the batches of inbred hybrid crosses that produced fertile eggs, a certain number failed to hatch, an event quite without parallel in the eggs of the first crosses. [Dr. Riding also notes that in the inbred hybrid crossings that he obtained, which produced fertile eggs, only some were fertile.]

(5) The larva of the inbred hybrids inclined rather to those of *T. crepuscularia* than to *T. bistortata*, although a few larvæ had the ⋀ mark united as in the larva of *T. bistortata*.

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III. *A List of Rumanian Orthoptera, with Descriptions of Three New Species.* By MALCOLM BURR, F.Z.S.

[Read November 17th, 1897.]

I AM indebted to the kindness of Prof. A. L. Montandon, of Bukharest, for an interesting collection of Orthoptera, taken this year in that sadly neglected hunting ground, Rumania. From this material I have been able to draw up a list of the Orthoptera at present known to occur in that country, including the species recorded from Dobrudsha by Brunner in his 'Prodromus der europaïschen Orthopteren,' and others, collected some years ago by Prof. Montandon, in the rich collection of European Orthoptera formed by M. de Bormans, which I have recently had the good fortune to acquire. Prof. Montandon has also provided me with notes explaining some of the localities, which are probably more or less unknown to British entomologists, thus enabling me to add a little local colour.

In Moldavia, Cruce is situated in the Carpathians, on the upper courses of the River Bistritza, in the north-west of the country. In Wallachia, Gurguiata and Plainesti are two small places in the district of Rimnik Sarat (Romnikui), a town and district to the north-east of Bukharest, on the confines of the plain on the last spurs of the Carpathians, near the frontier of Moldavia. Buzeo is a town and district to the west of Rimnik Sarat. Meledik is a locality in the Carpathians, on the River Slaniku, in the district of, and to the north of, Buzeo. Komana and Gradishtea are two localities to the south of Bukharest, on the road between Bukharest and the Danube. by the railway station Bukharest-Giurgevo. Komana is thickly wooded, apparently chiefly with pines, as the collection included two specimens of *Raphidia flavipes*, Stein, kindly identified by Mr. McLachlan.

In Dobrudsha, Tultcha (German, Tuldscha) is at the mouth of the Danube.

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List of the Species.

FORFICULARIA.

1. *Labidura riparia* (Pall.).

Buzeo, Meledik, and Gurguiata in the district of Rimnik Sarat. One male and one female of this cosmopolitan species.

2. *Labia minor* (L.). Bukharest.

3. *Forficula auricularia*, L.

Bukharest. Several specimens, including one male of the form *borealis*, Steph., with considerably elongated forceps.

BLATTODEA.

ECTOBIIDÆ.

4. *Ectobia lapponica* (L.).

Moldavia, Cruce, several specimens (*coll. mea*).

PHYLLODROMIIDÆ.

5. *Phyllodromia germanica* (L.).

Bukharest. The collection includes several specimens, with oothecæ, and the species seems to be established at Bukharest.

MANTODEA.

MANTIDÆ.

6. *Ameles decolor* (Charp.).

Tultcha in Dobrudsha (*Brunner*).

ACRIDIODEA.

TRYXALIDÆ.

7. *Tryxalis nasuta* (L.).

Bukharest. Two males, one female.

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8. *Chrysochraon brachypterus* (Ocskay).

Wallachia, Komana. One male. This species is fairly common in Southern and Eastern Europe, and occurs also in the region of the Amur (*Brunner*).

9. *Stenobothrus lineatus* (Panz.).

Wallachia, Komana. The two females included in the collection represent a curious variety; being entirely of a testaceous colour, with pale and dark markings; the head is larger than in British and French examples in my collection, and the green is quite lost. I do not attribute this to fading after death, as I possess specimens taken from one to twenty years ago, which retain their original colour.

10. *S. pullus* (Phil.).

Moldavia, Cruce (*coll. mea*).

11. *S. rufipes* (Zett.).

Wallachia, Komana. *S. rufipes* does not seem to be common, as Prof. Montandon's collection only includes two females.

12. *S. bicolor* (Charp.).

Wallachia, Komana and Gradishtea; Bukharest. Apparently a very common species.

13. *S. biguttulus* (L.).

Bukharest. Several specimens.

14. *S. dorsatus* (Zett.).

One curious reddish variety from Bukharest. The specimen is a female, with the posterior femora rosy exteriorly, and the mediastinal and scapular areas of the elytra rosy.

15. *S. pulvinatus* (Fisch. de W.).

Wallachia, Komana. Also Dobrudsha (*Brunner*). In the females the elytra are considerably abbreviated, and in the male these organs are shorter than the abdomen. *S. pulvinatus* is widely distributed, occurring in Europe

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from Sarepta on the Volga as far west and north as Paris (*Brunner*) and Jersey (*coll. mea*).

16. *S. elegans* (Charp.).

Moldavia, Cruce; one female. *S. elegans* does not seem to be a common insect anywhere, but it has a wide distribution, being found throughout Europe from England to Servia and Rumania, and perhaps in South Russia.

17. *Gomphocerus rufus* (L.).

Wallachia, Komana; three examples.

18. *Epacromia thalassina* (Fabr.).

Buzeo and Bukharest, several specimens.

ŒDIPODIDÆ.

19. *Acrotylus insubricus* (Scop.).

Wallachia, Komana and Gradishtea; Bukharest. Several specimens. In two specimens from Bukharest the red of the wings is very faint, and in the specimen from Gradishtea it is bleached to white.

20. *A. versicolor*, sp. n.

Plainesti, in the district of Rimik Sarat. One female.

21. *A. longipes* (Charp.).

Buzeo, Meledik; one faded example.

22. *Œdipoda cærulescens* (L.).

Bukharest; Gradishtea and Komana in Wallachia; several specimens. In addition to the type form, the collection contains two varieties, one with the blue of the wings almost obsolete, and the other, var. *sulfurescens*, Finot, with the red replaced by yellow. The last form seems to be the commonest in Algeria (*Finot, in coll. mea*), and I also possess a specimen from Ferrol.

23. *Psophus stridulus* (L.).

Moldavia, Cruce (*coll. mea*).

24. *Eremobia limbata* (Charp.).

Dobrudsha (*Brunner*).

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ACRIDIIDÆ.

25. *Caloptenus italicus* (L.).

Buzeo, Meledik; one female.

26. **Podisma alpinum* (Koll.), var. *collinum*, Brunn.

Wallachia, Komana; two females. *P. alpinum* is a native of Central Europe from Servia (*Brunner*) to Savoy (*coll. mea*); but the form *collinum* seems to be restricted to a more easterly distribution than the typical form.

27. *P. mendax*, Fisch.

Wallachia, Komana; two females. More or less common in the eastern half of Southern Europe.

28. *Platyphyma giornæ* (Rossi).

Bukharest. Several specimens.

TETTIGIDÆ.

29. *Tettix bipunctatus* (L.).

Bukharest, numerous examples.

30. *T. subulatus* (L.).

Wallachia, Gradishtea; Bukharest; Moldavia, Cruce. (*coll. mea*).

LOCUSTODEA.

CALLIMENIDÆ.

31. *Callimenus montandoni*, sp. n.

Wallachia, Komana. Of this fine new species, the collection contains a single male. I have great pleasure in dedicating it to Prof. Montandon, in recognition of the kindness he has shown me in communicating so interesting a collection.

PHANEROPTERIDÆ.

32. *Phaneroptera falcata* (Scop.).

Bukharest. Two females.

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* Scudder has shown that *Podisma*, Latr., has priority over *Pezotettix*, Burm. (Proc. U.S. Nat. Mus. xx, p. 95. 1897.)

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33. *Pœcilimon brunneri* (Friv.).
Dobrudsha (*Brunner*).

34. *P. fussi*, Brunn.
Dobrudsha (*Brunner*).

35. *Isophya modesta* (Fieb.).
Tultcha in Dobrudsha (*Brunner*).

36. *Leptophyes albovittatus* (Koll.).
Dobrudsha (*Brunner*).

MECONEMIDÆ.

37. *Meconema varium* (Fabr.).
Chiojden, in the district of Rimnik Sarat. One male.

CONOCEPHALIDÆ.

38. *Xiphidium hastatum* (Charp.).
Dobrudsha (*Brunner*).

DECTICIDÆ.

39. *Rhacocleis discrepans*, Fieb.
Common in Dobrudsha (*Brunner*).

40. *Platycleis brachyptera* (L.).
Moldavia, Cruce; one female (*coll. mea*).

41. *Thamnotrizon fallax*, Fisch.
Dobrudsha (*Brunner*).

42. *T. littoralis* (Fieb.).

Wallachia, Komana; one male. This fine species is found only in the south-eastern portion of the European Continent, in Dalmatia, Mehadia in Hungary, Servia, and Greece (*Brunner*).

43. *T. cinereus* (L.).

Wallachia, Komana; two females. This is the commonest and most widely-spread species of the genus, occurring

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from Lapland and Sweden to the Alps, from England to Southern Greece, and in the district of the Kazan Tartars, and also in the south-western portion of the Ural Mountains, where however it seems to be rare (*Eversmann*).

44. *Decticus verrucivorus* (L.).

Moldavia, Val de Barnaru; one male and two females (*coll. mea*).

EPHIPPIGERIDÆ.

45. *Ephippigera vitium*; Serv.

Wallachia, Komana; one female. It occurs also in Belgium, at Vienna, Freiburg, in the Siebengebirge and Servia (*Brunner, in coll. mea*).

GRYLLODEA.

ŒCANTHIDÆ.

46. *Œcanthus pellucens* (Scop.).

Bukharest; Plainesti in the district of Rimnik Sarat. Apparently a common species in Rumania.

GRYLLIDÆ.

47. *Nemobius saussurei*, sp. n.

Bukharest. Two females. This pretty little cricket differs from all the other European species of *Nemobius* in possessing fully-developed and caudate wings.

48. *Gryllus domesticus*, L.

Moldavia, Cruce (*coll. mea*); Bukharest.

49. *G. campestris*, L.

Wallachia, Komana; one nymph. The collection also contains some very immature specimens which are probably to be referred to this species.

50. *G. frontalis*, Fieb.

I have some hesitation in referring to this species an immature example from Bukharest.

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GRYLLOTALPIDÆ.

51. *Gryllotalpa gryllotalpa* (L.).

Moldavia, Cruce (*coll. mea*). I have ventured to restore the specific name given by Linnæus, which has a prior right over Latreille's *vulgaris*. The repetition is awkward, but cannot be helped (vide Entom. 1897, xxx, p. 189; also Brit. Orth., p. 67 in Nat. Journ., 1897).

TRIDACTYLIDÆ.

52. *Tridactylus variegatus*, Latr.

Wallachia, Gradishtea. Three specimens. This curious little cricket occurs throughout Southern Europe from Spain to Sarepta on the Volga, except apparently in Dalmatia and Greece; it also is found in Turkestan, Asia Minor, Algeria and Egypt. I possess an extremely rare variety, *alis caudatis*, from Turin.

Descriptions of the New Species.

Acrotylus versicolor, sp. n.

♀ Colore pallide-testacea. Caput rotundatum, oculis prominulis. Pronotum asperum, rugulosum, postice quam antice multo latius, margine postico rotundato. Elytra et alæ perfecte explicatæ, illa angusta, parte basali testacea, fusco-variegata, parte apicali hyalina; hæ amplæ, basi roseæ, fascia fusca marginem haud attingente ornatæ, parte apicali hyalina. Femora, tibiæ, tarsi testacea, genubus pallidis.

Long. corporis, 23 mm.: pronoti, 4 mm.: femorum posticorum, 12·5 mm.

Of a general light-testaceous colour. *Head* rounded and prominent, antennæ as long as the head and pronotum united. *Pronotum* hardly constricted, rugulose, with a deep cross furrow in the middle, hinder border rounded. *Elytra* narrow, basal half opaque, apical half hyaline. *Wings* ample, the basal part rosy pink; the centre with a dark-fuscous, short, broad crescent-shaped fascia, which nowhere reaches the margins; the remainder hyaline. *Crura*: posterior femora stout, pale-testaceous, with a few dark dots; posterior tibiæ pale, with a row of small black spines on each margin above.

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Head, pronotum, anterior and middle femora and tibiæ, the posterior femora beneath, posterior tibiæ, and valves of the ovipositor clothed with a few short fine hairs. Valves of the ovipositor curved.

Hab. WALLACHIA, Plainesti, in the district of Rimnik Sarat.

This new species differs from *A. insubricus*, Scop., in having the pronotum slightly more constricted, clothed only with very few and fine hairs, and its posterior margin rounded. In *A. insubricus*, when the head is viewed from above, the eyes can be seen to project beyond the sides of the head, but in *A. versicolor*, when the head is viewed from above, the eyes are seen to be situated right upon the top of the head and not to project beyond its margins. This species may be distinguished from *A. patruelis* (Sturm), by the much broader head and pronotum, the latter being considerably wider than the head. The dark fascia on the wings is narrower and darker than in *A. patruelis*, and the red colour of the wings is more sanguineous than the pale pink of the latter species.

A. versicolor may be distinguished from *A. longipes* (Charp.), by the presence of the dark fascia on the bright-red wings (yellow in *A. longipes*), and by the posterior margin of the pronotum being rounded (nearly straight in *A. longipes*).

Callimenus montandoni, sp. n.

♂, Glaber, statura major, totus ater, æneo-nitens. Caput rotundatum, pronoto latius. Pronotum postice quam antice latius, margine postico leviter emarginato, supra plicis longitudinalibus duabus ornatum, costis lateralibus acutis; prosterni lobi mesosternales triangulares, obtusi. Tibiæ tarsique atri; femora compressa, fusca, nigro-maculata, inermia; tibiæ omnes infra supraque utroque margine spinis multis validis armatæ.

Long. corporis, 53 mm.: pronoti, 18 mm.: femorum posticorum, 19·2 mm.

Head large, rounded, shining black; eyes small, brown; antennæ fuscous-brown. *Pronotum* shining black, very finely granulated, widening considerably posteriorly, concave above anteriorly, anterior margin nearly straight, lateral lobes concave, lower margin sinuate, the edges joining the superior surface to the lateral lobes forming a raised sharp ridge. *Abdomen* shining black, each segment with the

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posterior border adorned with one plica in the centre, with a larger plica on each side, outside each of which are 5—3 smaller plicæ, diminishing in number from anterior to the anal segments; subgenital lamina simple, with two plicæ beneath; cerci very obtuse. *Legs*: femora compressed, unarmed, dark-fuscous, with black dots; tibiæ stout, compressed, dark-fuscous, with a row of stout spines on each margin above and below.

Hab. RUMANIA, Bukharest.

I have great pleasure in dedicating this fine species to Prof. Montandon. It differs from *C. pancici*, Brunn., in having two, not four, longitudinal plicæ on the hinder part of the pronotum, which is a little more emarginate posteriorly. It may be distinguished from *C. oniscus*, Charp., by having the pronotum broader behind than in front, with sharper sides and more pointed mesosternal lobes. It further differs from both these species in being almost entirely black, with a metallic sheen.

The only other species of the genus is *C. inflatus*, Brunn., from Asia Minor, which seems to be very distinct and is considerably smaller.

Nemobius saussurei, sp. n.

♀ Parva, testacea, nigro-setosa. Caput pronoto paulo latius; antennæ longiores, oculi nigri. Pronotum antice quam postice angustius. Elytra et alæ perfecte explicatæ, hæ caudatæ, illa pellucida, castanea. Tibiæ posticæ margine interiore spinis 4, quarum prima brevissima, margine exteriore spinis 2 supra armatæ, calcaribus terminalibus exceptis. Cerci ♀ ovipositore brevi longiores.

Long. corporis, 8 mm.: pronoti, 2 mm.: elytrorum, 4 mm.: femorum posticorum, 4·5 mm.: ovipositoris, 2·5 mm.

Head dark castaneous-brown, and with the pronotum, clothed with long dark stiff bristles. *Pronotum* flat, dark castaneous-brown, broader posteriorly than anteriorly. *Elytra* long, but not reaching the apex of the abdomen, truncated posteriorly in the female, pellucid, pale castaneous. *Wings* caudate, reaching well beyond the cerci. *Legs* pubescent, dark brown, tibiæ somewhat paler than the femora. *Ovipositor* very short, slightly curved upwards, and slightly dilated at the apex. Cerci longer than the ovipositor.

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Hab. RUMANIA, Bukharest.

The perfectly developed wings distinguish *N. saussurei* at once from the other European species of the genus, but as this is not sufficient alone, I will enumerate other marks of difference. It is considerably smaller than *N. sylvestris* (L.), lighter in colour, and with the ovipositor much shorter. It is smaller and paler than *N. lineolatus* (Brullé). It is most closely allied to *N. heydeni*, Fisch., but is slightly larger, and lacks the pale lines upon the head and pronotum that distinguish the latter species; it also differs in having two, and not four, spines on the exterior margin above of the posterior tibiæ, whereas *N. lineolatus* has three. It is paler than *N. heydeni*, in which the pronotum is cylindrical, and is not broader posteriorly than anteriorly, as in *N. saussurei*.

I dedicate this species with much pleasure to Dr. Henri de Saussure, of Geneva.

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IV. *Notes on American and other Tingitidæ, with Descriptions of two new Genera and four Species.*

By GEORGE CHARLES CHAMPION, F.Z.S.

[Read December 1st, 1897.]

PLATES II, III.

THE following notes were made while studying the numerous Central-American species of this family of Heteropterous insects (*cf.* Biol. Centr.-Am., Rhynchota, ii, pp. 1-48). Most of the corrections in the synonymy of various South-American species have already been noted by me, but as they may be overlooked in a work dealing with a limited fauna, they are here repeated. Professor Poulton having kindly lent me the small but valuable collection of American Tingitidæ belonging to the Oxford Museum—mostly from the Antillean island of St. Vincent, or from the Amazons (*Bates*),—some remarks on these are added, with descriptions of one new genus and three species. Herr A. Handlirsch, also, has sent me for examination a large number of American Tingitidæ belonging to the Vienna Museum: amongst these, there are specimens of an interesting new genus, from Lower California, allied to *Acalypta*, Westw., a description of this insect being included in the present paper. The opportunity is taken, too, of figuring a number of the types of Stål's South-American species, very many of which, including those of all his numerous American genera, have been communicated by Dr. Aurivillius of the Stockholm Museum. The two South-American species of *Monanthia* described by Mr. Distant (Ann. Soc. Ent. Belg. 1888, p. lxxxiii) are also figured.

PHYLLOTINGIS, Walker.

This genus (= *Alyattes*, Stål, 1865, and *Euloba*, Uhler, 1884), based upon a single species from the Amazons, *P. arida*, Walk. (= *eximia*, Hagl., and *pallida*,

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Uhler), is incorrectly referred to the Tingitidæ: it belongs to the Aradidæ. The name *Alyattes* being preoccupied, Dr. Bergroth [Verh. zool.-bot. Ges. Wien, xxxvi, p. 59 (1886)] has substituted *Phyllocraspedum* for it; Walker's name, published in 1873, must however be retained.* His species will stand as *Phyllotingis eximia*, Haglund's name having five years' priority. Two others are now known.

SOLENOSTOMA, Signoret.

Coleopterodes, Philippi, Stett. ent. Zeit. xxv, p. 306 (1864).

This genus includes a single species, *S. liliputianum*, Sign. (= *Coleopterodes fuscescens*, Philippi), from Chili. There are two specimens of it in the Oxford Museum.

DOLICHOCYSTA, gen. n.

Rostrum extending to the meso-metasternal suture. Rostral groove uninterrupted, narrow and parallel on the pro- and mesosternum, closed in front, the buccal laminæ long and very prominent. Intercoxal portion of the metasternum broad and transverse. Antennæ slender, widely separated at the base. Head without spines, the eyes small. Pronotum tricarinate, with broad, rounded, closely reticulated membranous margins, and a long decurved, anteriorly prominent hood, the triangular posterior portion largely developed, acute at the tip. Elytra short, broad oval, a little longer than the abdomen; discoidal area large, occupying more than two-thirds of the length of the elytra, raised externally, and surrounded by prominent nervures, the outer (median) nervure subfoliaceous; subcostal area about as wide as the costal; costal area of uniform width from the base to near the apex, biseriate almost to the tip. Orifice not visible. Legs very slender.

This genus bears a general resemblance to *Acalypta*, Westw. (= *Orthostira*, Fieb.); but differs from it in the very prominent buccal laminæ, which close the rostral groove in front, the long, anteriorly prominent, decurved pronotal hood, &c. It is perhaps best placed near *Corythaica*, Stål. The specimens described may perhaps belong to a brachypterous form; they are from the northern part of Lower California.

* The antennæ are incorrectly described by Walker, the type having a very elongate basal joint

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I. *Dolichocysta venusta*, sp. n. (Pl. II., figs. 1; 1a, profile.)

Broad oval, short, dull; fuscous, the pronotum with the areolæ at the sides in front and behind, the areolæ of the hood in part, the tip of the posterior process, and the three carinæ, a broad blackish patch on the median one excepted, more or less whitish and subhyaline; the elytra greyish, with a spot on the discoidal area before the apex, a patch on the costal area before the middle, and some spots or some of the nervures before and beyond it, black, the other portions of the costal area whitish and subhyaline with pale nervures, the nervures on the rest of the elytra blackish or fuscous; the antennæ testaceous, with the outer half of the apical joint black; the legs testaceous, the femora black or piceous in the middle. Antennæ with joints 1 and 2 stouter than the others, 2 much shorter than 1, 3 very slender and elongate, 4 lanceolate and pilose, about as long as 1 and 2 united. Pronotum closely punctured on the disc; the membranous margins with 3—4 rows of small areolæ; the median carina strongly, the two outer carinæ feebly, foliaceous, the latter sinuous and connected anteriorly with a layer of membrane which fills the space outside the base of the hood; hood extending beyond the head, narrowed and strongly curved downwards in front, rather widely reticulated. Elytra a little wider than the pronotum; discoidal, subcostal, and sutural areas (the margin of the latter excepted) closely reticulated; costal area slightly recurved, with larger areolæ, the two rows diminishing to one at the apex.

Length $2\frac{1}{3}$—$2\frac{1}{2}$, breadth $1\frac{1}{3}$—$1\frac{1}{4}$ millim.

Hab.—Lower California, Guadalupe (*Bilimek, in mus. Vind. Cæs.*).

Three examples, two of which are from Guadalupe, the other without definite locality. The insect is not included in Prof. Uhler's list of Hemiptera Heteroptera of Lower California [Proc. Calif. Acad. Sci. (2) iv, pp. 223-295 (1894)].

Corythucha, Stål.

Numerous closely allied American species belong to this genus. *Monanthia lucida*, Walk. (= *C. fuscigera*, Stål), and *Tingis spinosa*, A. Dugès, both from Mexico, also appertain here. Stål's type of *C. fuscomaculata*, from Brazil, is figured on Plate II, fig. 2. This last-mentioned insect is extremely like *C. fuscigera*, Stål, but it appears to have the apical margin of the elytra less rounded, the inner portion being oblique.

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Tingis, Fabr.

Stål (Enum. Hemipt. iii, p. 123) uses the name *Stephanitis* for the European *Tingis pyri*, Fabr., and *T. oberti*, Kol., and a very dissimilar South-American form, *S. mitrata*, Stål, but this course has not been followed by Lethierry and Severin. The American species ought to be separated, and the name *Stephanitis* could be retained for it. Stål's type is figured on Plate II, figs. 3, 3*a*.

It may be here noted that the insect figured in Cuvier's Règne Animal, Ins., Atlas, ii, pl. 91, figs. 5, 5*a*, *b*, under the name *Tingis cristata*, Panz., is evidently referable to *T. pyri*, Fabr. It has nothing to do with Panzer's species.

Leptobyrsa, Stål.

The type of this genus is *L. steini*, Stål, from Rio Janeiro. It is figured on Plate II, fig. 4. Two others have been described by Berg from Buenos Ayres and five by myself from Central America.

Gargaphia, Stål.

This genus seems to be well characterised by the prominent transverse sinuous ridge between the meso- and metasternum, the cordate intercoxal portion of the metasternum being surrounded at the sides and in the front by a continuous membranous ridge. The species are all American.* Stål's type of *G. trichoptera*, from Bogota, Colombia, is figured on Plate II, fig. 5.

Corythaica, Stål.

Typonotus, Uhler, Proc. Zool. Soc. Lond. 1893, p. 716.

The characters of this genus were taken by Stål and Uhler from the same species, *C. monacha*, Stål (= *Tingis cyathicollis*, Costa, and *Typonotus planaris*, Uhler), the type of *C. monacha* being from Rio Janeiro and that of *T. planaris* from the Island of St. Vincent. Numerous specimens of the species are contained in the Oxford Museum. Stål's type has been communicated by Dr.

* *Tingis formosa*, Göldi, from Pará, probably belongs here or to *Leptostyla*, Stål.

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Aurivillius. The insect has been beautifully figured by A. Costa. The second known species of the genus, *C. carinata*, Uhler, is from the Island of St. Vincent, and it has also been found in Guatemala by myself.

Pachycysta, gen. n.

Rostrum reaching the first ventral suture. Rostral groove subparallel, uninterrupted, closed in front, the buccal laminæ not prominent, the meso- and metasternal laminæ slightly converging behind. Antennæ pilose, distant at the base, with moderately long, slender joints, 1 and 2 stouter than 3, 1 a little longer than 2, (4 broken off) Head with five short decumbent spines, very short, obtuse antenniferous tubercles, and an oblong, smooth, convex prominence in front. Pronotum with a very large, oval, anteriorly truncate hood, three foliaceous carinæ, and very broad, shell-like, incurved membranous margins. Elytra oval, rounded at the tip; discoidal and subcostal areas closely, the costal and sutural areas more widely, reticulated, the costal area very broad, with three or fours rows of hyaline areolæ, the discoidal area extending to the middle and surrounded by prominent nervures. Orifice visible. Nervures of the pronotal processes and elytra stout, thickly pilose.

The single species from which the above characters are taken is perhaps nearest allied to the monotypic genus *Megalocysta*, Champ.; but differs from it in having the pronotum strongly tricarinate, with the membranous margins greatly extended, vertical, and shell-like, and the reticulation of the elytra and of the membranous portions of the pronotum very much closer, &c. It cannot be included in *Leptostyla* or any of the other genera characterized by Stål.

Pachycysta diaphana, sp. n. (Pl. II, figs. 6, 6*a*.)

Body ferruginous, the integument testaceous, the areolæ of the elytra and pronotal processes more or less hyaline, the nervures and the costal margin thickly clothed with very short pallid hairs; the legs and antennæ ferruginous. Pronotum with the three carinæ strongly foliaceous, each with a row of transverse hyaline areolæ, the median carina angularly raised anteriorly, the outer carinæ curved inwards and partly covered by the hood; the hood extending to about the middle, rather closely reticulated; the membranous shell-like margins rounded externally, with numerous small areolæ; the triangular posterior portion large, and, like the disc, closely

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reticulated. Elytra with the subcostal area biseriate; the broad costal area with three to four rows of rather small areolæ; the sutural area unequally reticulated. Wings extending to a little beyond the abdomen.

Length 3¾, breadth nearly 2 millim. (♀.)

Hab. AMAZONS (*Bates, in Mus. Oxon.*).
One example.

LEPTOSTYLA, Stål.

Four American species were referred to this genus by Stål; one other has since been added by Berg, and seventeen by myself; *Monanthia lineifera*, Walk., from Brazil, also belongs to it.* It is one of the most characteristic genera of the family in Central America. Stål's type of *L. furcata*, from Rio Janeiro, is figured on Plate II, figs. 7, 7*a*.

LEPTOPHARSA, Stål.

This genus will probably prove to be inseparable from *Leptostyla*. Two species were known to Stål and a third has been added by myself, all from Tropical America. Stål's type of *L. elegantula*, from Colombia, is figured on Plate II, fig. 8.

LEPTODICTYA, Stål.

Five Tropical-American species were included by Stål under *Leptodictya*, and two others have been added by myself. *Monanthia tabida*, H.-S., from Mexico, also belongs here. Stål's type of *L. fusocincta*, from Rio Janeiro, is figured on Plate II, fig. 9.

ACANTHOCHILA, Stål.

The type of this genus is *A. armigera*, Stål (= *spinuligera*, Stål), from Rio Janeiro, this species being now known to extend northwards to Southern Mexico. Two others have since been added by Buchanan White and Uhler respectively. *A. armigera* has been figured by me elsewhere.

* The type of an allied species, *M. lanceolata*, Walk., from Brazil, is apparently lost, as it cannot now be found in the British Museum.

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Leptocysta, Stål.

Stål's single species, *L. sexnebulosa*, from Rio Janeiro, is figured on Plate II, figs. 10, 10*a*.

Sphærocysta, Stål.

Of the two Brazilian species included in this genus, one, *S. globifera*, Stål, is figured on Plate II, figs. 11, 11*a*.

Amblystira, Stål.

Stål included in this genus a single species, *A. pallipes*, from Rio Janeiro, and four others have been added by myself. The type of *A. pallipes* is figured on Plate II, fig. 12.

Leptoypha, Stål.

The type of this genus is *Tingis mutica*, Say, from Texas. Two allied forms from Mexico and Guatemala have been figured and described by me elsewhere.

Tigava, Stål.

This genus was based upon a single species, *T. præcellens*, Stål, from Rio Janeiro; two others have been added by me from Central America. Stål's type is figured on Plate III, fig. 1.

Teleonemia, Costa.

Tingis, subgen. *Americia*, Stål, Enum. Hemipt. iii, p. 131.

Lasiacantha, Lethierry et Severin, Cat. Hémipt. Hétéropt. iii, p. 18 (part.).

This appears to be the most characteristic genus of Tingitidæ in Tropical America, fourteen being known to me from Central America alone.

The types of Stål's species of *Teleonemia* have been communicated by Dr. Aurivillius, also those of *Tingis* (*Americia*) *albilatera* and *T.* (*Americia*) *limbata*. *T. albilatera*, as I have noted elsewhere, = *Tingis triangularis*, Blanch., Stål apparently not having seen Blanchard's figure. The types of the following species are figured on Plate III: *T.* (*Amauro-*

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sterphus) ***morio***, fig. 2; ***T. validicornis***, fig. 4; ***T. luctuosa***, fig. 5; ***T. prolixa*** (?=*elevata*, Fabr.), fig. 6; ***T. belfragii***, fig. 8; also that of *T.* (*Americia*) ***limbata***, fig. 10. A figure of *T. aterrima* is given, fig. 3, from a specimen from the Amazons in the Oxford Museum, Stål's type having the apical joint of the antennæ broken off.

Of *T. sacchari*, H.-S. and Stål, there are numerous specimens from the Island of St. Vincent in the Oxford Museum.

The two following species from the Amazons cannot be identified with any of the known members of the genus, and they are therefore treated as new.

Teleonemia longicornis, sp. n. (Pl. III, fig. 7.)

Elongate, narrow, dull; fusco-ferruginous, the spines on the head, and the margins, carinæ and hood of the pronotum testaceous, the triangular posterior portion of the latter yellowish; the elytra fuscous, with the base, the outer and inner margins of the sutural area, the costal margin, and the nervures of the costal area from a little beyond the middle to near the apex, testaceous, the areolæ of the latter for a similar distance, and also some of those along the apical margin, and two of the inner ones before the tip, hyaline; the antennæ ferruginous, the two basal joints and the apex of the third darker, the fourth joint black; the legs ferruginous. Head with decumbent spines; antennæ very elongate, about as long as the elytra, moderately stout, joint 2 slightly shorter than 1, 3 three times as long as 4, 4 pilose. Pronotum sharply tricarinate, and with a small, compressed, angularly projecting hood in front, the marginal carinæ moderately prominent, the interspaces coarsely, closely punctate. Elytra long, constricted beyond the middle, and slightly dilated at the apex, the apices bluntly rounded, the median nervure prominent; discoidal area with rather deeply impressed areolæ; subcostal area biseriate; costal area with a single row of transverse areolæ from about the middle onwards, becoming vertical and cariniform towards the base. Rostrum reaching the meso-metasternal suture.

Length 5, breadth 1½ millim. (♂.)

Hab. AMAZONS (*Bates, in Mus. Oxon.*).

One example. This insect resembles Costa's figure of *T. funerea*, but has shorter, less parallel, and differently coloured elytra, the small pronotal hood more prominent in front, &c. Amongst the numerous species described by

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Stål (the types of all of which are before me) it is perhaps nearest allied to *T. scrupulosa*, from which it may be separated by the very long and less distinctly pilose antennæ, the longer elytra, with glabrous discoidal area and the hyaline areolæ of the costal area not extending to the base, &c.

Teleonemia brevipennis, sp. n. (Pl. III, fig. 9.)

Moderately elongate, narrow, dull; blackish-fuscous, the spines on the head and the front of the pronotum obscure testaceous, the triangular posterior portion of the pronotum, and the hood in part, yellowish; the elytra fuscous, with the costal margin and the nervures of the costal area for some distance beyond the middle testaceous, the areolæ of the latter to near the apex hyaline. Head with decumbent spines; antennæ long and moderately stout, joint 2 considerably shorter than, and not so stout as, 1, 3 rather more than twice the length of 4, 3 and 4 clothed with very short hairs. Pronotum sharply tricarinate, and with a small, compressed, subangularly projecting hood in front, the marginal carinæ prominent, the interspaces coarsely, closely punctate. Elytra (when closed) suboval, comparatively short, rounded at the apex; discoidal area with deeply impressed areolæ, the nervure limiting it externally rounded and prominent; subcostal area biseriate; costal area rapidly widening beyond the middle, very narrow towards the base, with a single row of areolæ, increasing to two in the widest part, the areolæ small to about the middle and then becoming larger and transverse. Rostrum reaching the meso-metasternal suture.

Length $3\frac{3}{4}$, breadth $1\frac{1}{2}$ millim. (♀.)

Hab. Amazons (*Bates, in Mus. Oxon.*).

This species differs from all the *Teleonemiæ* known to me in the relatively short, somewhat oval elytra. The costal area is abruptly widened beyond the middle, and at the widest part there are two additional hyaline areolæ, there being thus two rows at this place. The wings extend beyond the abdomen. The insect approaches the *Tingis* (*Americia*) *limbata*, of Stål, which would be better placed in *Teleonemia*.

Eurypharsa, Stål.

The type of this genus is *Tingis nobilis*, Guér., from, Tropical South America, and *T. circumdata*, Blanch.,

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belongs to the same species. There are two specimens of it in the Oxford Museum: one labelled "S. Amer., d'Orbigny, ex Mus. Jard. Plantes," this being, no doubt, one of Blanchard's types, which were from Chiquitos, Bolivia; and the other from the Amazons (*Bates*). A second species has been described by me from the State of Panama. Both have been figured.

Monanthia, Lep.

The four Tropical-American representatives of this genus known to me—*M. monotropidia*, Stål, *M. parmata*, Dist., and *M. loricata*, Dist., and a new species described by me elsewhere—are closely allied.

Figures of Mr. Distant's species are here given on Plate III: fig. 11 being taken from *M. loricata*, and fig. 12 from *M. parmata*.

Explanation of Plates II and III.

[*See Explanation facing the* Plates.]

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V. *A List of the* Cicindelidæ, Carabidæ *and* Staphylinidæ *collected by* Mr. J. J. WALKER, R.N., F.L.S., *in the region of the Straits of Gibraltar.* By GEORGE CHARLES CHAMPION, F.Z.S.

[Read December 1st, 1897.]

IN the Transactions of the Entomological Society for 1891, pp. 375—401, I gave a list of Heteromerous Coleoptera collected by Mr. Walker in the region of the Straits of Gibraltar. The present paper contains a list of the Cicindelidæ, Carabidæ, and Staphylinidæ, forming part of the same collection. It has been prepared with the assistance of M.M. Bedel and Fauvel, both of whom are engaged at the present time in the publication of a list of the N. African species of these families, M. Bedel with the Cicindelidæ and Carabidæ and M. Fauvel with the Staphylinidæ. A considerable portion of their work (that of M. Bedel having been commenced in March 1895, and that of M. Fauvel during the present year) has now been published. The chief object of this paper is to give a list of the species inhabiting the European side of the Straits, as well as of those found on the N. African side. At the end of the Carabidæ, a list of the N. African species not met with by Mr. Walker is inserted, compiled from M. Bedel's Catalogue* as far as published, and from MS. notes kindly communicated by him. In this family a considerable number of species do not cross the Straits, some conspicuous forms being confined to the African side (e.g. *Casnonia olivieri*, &c.) and others (*Carabus favieri*, *Acinopus giganteus*, *Percus politus*, *Aptinus displosor*, &c.) to the Spanish side. Since the publication of the Andalusian lists of Rambur (1842), Rosenhauer (1856), Dieck (1870), v. Heyden (1870), &c., many additional species of Carabidæ have been detected in the country bordering the Straits of Gibraltar. My own researches in Andalusia

* Catalogue Raisonné des Coléoptères du Nord de l'Afrique (Maroc, Algérie, Tunisie et Tripolitaine), avec notes sur la Faune des Iles Canaries et de Madère.

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(1895) were almost entirely confined to more inland localities—Ronda, Granada, Lanjaron, Sierra Nevada, &c., —and I have therefore nothing to add to the present list. To Mr. Walker's unflagging energy the addition of several species to the N. African Catalogue is due, as may be seen by a reference to M. Bedel's work, in which many of his captures are noted. Several interesting species having been found by him at Malaga, they are included in the present list, though this locality is rather beyond the limits of the Straits. The species marked with a * are additions to v. Heyden, Reitter, and Weise's European Catalogue (1891). Of Cicindelidæ and Carabidæ 230 species were met with by Mr. Walker, 68 of which are found in Britain; 35 others are known from the Maroccan side of the Straits, 12 of which are British.

CICINDELIDÆ.

Cicindela, L.

C. flexuosa, F. Tetuan, Gibraltar, and Malaga: sandy places, abundant. The commonest species of the genus at Gibraltar, nearly all the year.

C. lunulata, F. Gibraltar: abundant on the sea-beach, not seen in winter.

C. lunulata F., var. *littoralis*, F. Tetuan, Gibraltar.

C. maura, L., var. *mülleri*, Beuth. Tangier. Gibraltar: sandy banks of streams, local, San Roque, &c. Apparently the only form of the species in the region, of the Straits. All the specimens have the humeral spots widely separated, but in some of those from both Gibraltar and Tangier the median fascia is divided into two spots.

C. luctuosa, Dej. Tangier: rarely. Probably confined to Marocco.

C. trisignata, Dej. Tetuan and Tangier: not common. A well-known European species. Found by Rambur at Malaga.

C. campestris, L. Gibraltar: sandy places, in the spring, common.

C. campestris, L., var. *maroccana*, F. Tangier and Gibraltar: perhaps more numerous than the typical form at Gibraltar.

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CARABIDÆ.*

Calosoma, Weber.

C. sycophanta, L. Gibraltar: wood near Algeciras, running on trunks of cork-oaks, four specimens. It occurs in Marocco, Algeria, Tunis, &c.

C. maderæ, F. (*indagator*, F.). Tetuan. Gibraltar: two specimens—one in flood refuse, in the dockyard, and one at Sierra Lorca.

Carabus, L.

C. favieri, Fairm. Tangier: one specimen. Not found in Europe.

C. dufouri, Dej. Gibraltar: under stones, not rare, winter, Campamento, &c. Not recorded from N. Africa.

C. melancholicus, F. Gibraltar: under stones in damp places, winter, not rare. Occurs at Tangier.

C. rugosus, F. Tetuan, Tangier: two specimens. Gibraltar: under stones, winter, Rock, Campamento, &c., not rare.

Nebria, Latr.

N. complanata, L. Tetuan and Ceuta: in plenty at Tetuan. Gibraltar: eastern beach, under wreck timber, &c., invariably below high-water mark, common. Recorded from Tangier.

N. andalusiaca, Ramb. Tetuan, Tangier, Djebel Mousa (Ape's Hill), Gibraltar: under stones, not common.

N. rubicunda, Quens. Tangier, Algeciras: a few examples, under stones.

Leistus, Fröl.

**L. amplicollis*, Fairm. Djebel Mousa (Ape's Hill) and Gibraltar. One specimen from each locality.

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* The record of *Cathoplius asperatus*, Dej., from Gibraltar, mentioned by M. Bedel (Cat. p. 22), upon Mr. Walker's authority, is a mistake: the insect in question was given to Mr. Walker at Gibraltar by Mr. W. Glassford; it probably came from Casablanca or Larache on the Moroccan coast, where the species is known to occur.

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Described from a single example from Tangier. The Gibraltar example has been compared by M. Bedel with the type.

L. fulvibarbis, Dej. Tetuan and Gibraltar: under stones, rare.

NOTIOPHILUS, Dum.

N. 4-punctatus, Dej. Gibraltar: several specimens, Linea, &c. Occurs at Tangier and elsewhere in N. Africa.

N. geminatus, Dej. Tangier. Gibraltar: sparingly, San Lorca. Occurs also in the Canary Is. and in Madeira.

SCARITES, F.

S. buparius, Forst. (*gigas*, F.). Gibraltar: sandy places, Neutral ground, &c., common. Occurs in N. Africa, Canary Is., &c.

S. occidentalis, Bedel (*polyphemus*, olim). Tangier. Occurs along the littoral of the Iberian peninsula, from Lisbon to Cadiz (teste Bedel).

S. saxicola, Bon. (*hespericus*, Dej.). Tetuan, Tangier, Gibraltar, and Algeciras: under stones, winter and spring, not rare.

S. terricola, Bon. (*arenarius*, Bon.). Tetuan and Malaga: one example from each locality.

S. lævigatus, F. Tetuan, Gibraltar, and Malaga: a few specimens. Recorded from Tangier.

S. planus, Bon. Tetuan and Ceuta. Gibraltar: in flood refuse, in the spring, not rare.

DYSCHIRIUS, Bon.

D. arenosus, Steph. (*thoracicus*, Gyll.). Tetuan. Gibraltar: sandy ground, behind Linea, locally common.

D. rufo-æneus, Chaud. Tangier. Gibraltar: San Roque, Linea, &c., sandy places, also on clay.

D. punctatus, Dej. Tetuan. Gibraltar: bed of stream near Campamento and on the neutral ground, rare. Recorded from Tangier.

D. chalybeus, Putz. Tetuan: one specimen. A European species. Recorded from Tangier.

D. pusillus, Dej. Tetuan: in plenty. A Mediterranean insect.

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TACHYPUS, Lap. (ASAPHIDION, Gozis).

T. flavipes, L. Tetuan, Tangier. Gibraltar: under decaying pine branches. First pine wood.

BEMBIDION, Latr.

B. ambiguum, Dej. Tetuan and Tangier. Gibraltar: Campamento, &c., not rare.

B. lampros, Herbst. Gibraltar: in flood refuse, three examples. Not included in M. Bedel's N. African list.

B. lætum, Brullé. Tetuan: one specimen. Gibraltar: one specimen, on a wall, Campamento. Recorded from Tangier.

B. varium, Ol., var. *semipunctatum*, Don. Tetuan: not rare. Gibraltar.

B. lusitanicum, Putz. Gibraltar: one specimen, Campamento beach, March 1888. Not included in M. Bedel's N. African list.

B. nitidulum, Marsh. Gibraltar: in the bed of the river Palmones. Occurs in Tunis and Algeria.

B. dahli, Dej., var. *cribrum*, Duv. Tetuan: in flood refuse, not rare. A South European species. Recorded from Tangier.

B. elongatum, Dej., var. *nordmanni*, Chaud. Tetuan: in flood refuse, with the preceding. Recorded from Tangier, Tunis, and Algeria.

B. genei, Küst. (*4-guttatum.*, Ill.). Gibraltar: not rare. Recorded from N. Africa.

B. normannum, Dej. Tetuan. A common littoral species in Europe. Recorded from Tangier.

B. minimum, F. Tetuan: with the preceding. A well-known European species.

B. octomaculatum, Gœze (*sturmi*, Panz.). Tetuan: in flood refuse, two specimens. Gibraltar: one specimen, Campamento. Recorded from Tangier.

B. vicinum, Lucas. Gibraltar: two specimens. Recorded from Tangier and elsewhere in N. Africa.

B. lunulatum, Geoffr. (*biguttatum* Gyll.). Tangier and Gibraltar.

B. iricolor, Bedel. Tetuan and Gibraltar: in flood rubbish, common.

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Ocys, Steph.

O. harpaloides, Serv. (*rufescens*, Guér.). Tetuan and Gibraltar: in flood rubbish.

Tachys, Steph.

T. bisulcatus, Nic. Tetuan: two specimens. A European species, occurring also in Madeira.
T. globulus, Dej. Tetuan, Gibraltar: in damp places and in flood rubbish, not rare.
T. hæmorrhoidalis, Dej. Tetuan. Gibraltar: in flood refuse, common. Recorded from Tangier.
T. sexstriatus, Duft., var. *bisbimaculatus*, Chevr. Tetuan: one example. A South European species.
T. parvulus, Dej. Malaga: one specimen.
T. bistriatus, Duft. Tetuan, Tangier, Gibraltar: not uncommon. Recorded from Madeira and the Canary Is.
T. micros, Fisch. (*gregarius*, Chaud.). Gibraltar: two specimens. Recorded from Algeria.
T. scutellaris, Steph. Tetuan and Tangier. Gibraltar: in flood rubbish on the beach, Linea.
T. algiricus, Lucas. Tetuan, Gibraltar: not rare, in wet places. Recorded from Tangier.

Anillus, Duv.

A. massinissa, Dieck. Tangier: in numbers, under large deeply-embedded stones, in clayey soil. Malaga: three specimens.

Perileptus, Schaum.

P. areolatus, Creutz. Tetuan. Gibraltar: in flood refuse, Campamento. Malaga.

Trechus, Clairv.

T. fulvus, Dej. (*lapidosus*, Daws.). Tangier. Gibraltar: a few specimens in spring, in flood refuse, on the Rock.
T. quadristriatus, Schrank (*minutus*, *F.*), var. *obtusus*, Er. Tetuan and Gibraltar.

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**T. tingitanus*, Putz. Tangier. Gibraltar: not rare, in flood rubbish, Campamento. Not included in von Heyden, Reitter, and Weise's European Catalogue. It has already been quoted by M. Bedel from Gibraltar.

Deltomerus, Motsch.

D. rufipennis, Dej. Gibraltar: one example. Recorded by M. Bedel from Tangier.

Pogonus, Nicolai.

P. smaragdinus, Waltl. Tetuan and Gibraltar: one specimen in each locality. Recorded from Tangier.

P. litoralis, Duft. Tetuan: rarely. A well-known European species.

P. chalceus, Marsh. Tangier, Tetuan, and Gibraltar: common.

Apotomus, Ill.

A. rufus, Rossi. Tetuan. Gibraltar: under stones, in winter, common. Recorded from Tangier.

A. flavescens, Apetz. Tangier: not uncommon. Apparently not found on the European side of the Straits.

A. rufithorax, Pecch. Tetuan: a few specimens, including one with the elytra rufous (?=*testaceus*, Dej.). Recorded from Portugal, Tuscany, Sicily, &c., as well as from Tangier.

Panagæus, Latr.

P. crux-major, *L.* Tetuan: in plenty in the Esmir marsh in damp tufts of grass. A well-known European species. Recorded from Marocco by M. Bedel from Mr. Walker's specimens only.

Chlænius, Bon.

C. spoliatus, Rossi. Tetuan: Plain of Buzaghal, Esmir marsh, in plenty, in flood rubbish, &c. A European species. Recorded from Tangier.

C. circumscriptus, Duft. Tetuan: sparingly, with the preceding. Recorded from Tangier. Occurs in Southern Europe, Canary Is., S. Africa, &c.

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C. decipiens, Dufour (*azureus*, Duft.). Tetuan: four specimens. Gibraltar: under stones, Campamento, very rare. The examples from Tetuan belong to the var. *algericus* Raffr., which is said to be peculiar to N. Africa.

C. tristis, Schall. (*holosericeus*, F.). Tetuan: in plenty, Esmir marsh, in cut reeds. Gibraltar: in flood refuse, rare, Campamento. Recorded from Tangier and Malaga.

C. variegatus, Geoffr. (*agrorum*, Oliv.). Tetuan: in plenty. Gibraltar: in flood refuse and in damp places, common. Recorded from Tangier.

C. vestitus, Payk. Benzus Bay, Marocco. Gibraltar: wet places, abundant, Campamento. Recorded from Tangier.

C. velutinus, Duft. Tangier and Gibraltar: common, under stones, in the beds of streams. The variety *auricollis*, Gené, occurred on both sides of the Straits, predominating at Tangier.

C. nigricornis, F. Gibraltar: one specimen, in flood refuse, Campamento. Not included in M. Bedel's N. African list.

C. chrysocephalus, Rossi. Tetuan, Tangier: plentiful. Gibraltar: under stones, in damp places, local, but common when found.

C. macrocerus, Chaud. Tangier: not common. Doubtfully recorded from Spain.

C. virens, Ramb. Tetuan: rare. Gibraltar: abundant, under stones, Campamento. Some of the Spanish specimens have the thorax and elytra deep violet, like those found in Marocco. Recorded by Rambur from San Roque.

Callistus, Bon.

C. lunatus, F. Gibraltar: one specimen, Sierra Carbonera under a stone in a damp place. This genus has not been noticed as yet in N. Africa.

Oodes, Bon.

O. hispanicus, Dej. Tangier: one specimen. Found in Spain and Portugal.

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O. mauritanicus, Luc. Tetuan: in plenty, in the Esmir marsh, in flood refuse. Probably confined to N. Africa.

DIPLOCHILA, Brullé.

D. ægyptiaca, Dej. Tetuan: one specimen. Recorded from Andalusia, Tangier, &c.

LICINUS, Latr.

L. punctatulus, F. (*granulatus*, Dej.). Tangier and Tetuan. Gibraltar: common and generally distributed, under stones.

BADISTER, Clairv.

B. bipustulatus, F. Tetuan. Gibraltar: in moist places and in flood refuse, rare. Recorded from Tangier.

B. peltatus, Panz. Tetuan: four specimens, Esmir marsh. A European species. The only N. African capture mentioned by M. Bedel is Mr. Walker's.

AMBLYSTOMUS, Er.

A. mauritanicus, Dej. Tangier. Algeciras and Gibraltar: under bark and beneath stones, winter, not common.

A. metallescens, Dej. Tetuan and Ceuta. A Mediterranean species.

A. niger, Heer. Tetuan. Gibraltar: not rare, in tufts of grass, in winter. Recorded from N. Africa.

A. algirinus, Reitt. Tangier: one specimen. Perhaps confined to N. Africa, but confounded till recently with *A. niger*.

SIAGONA, Latr.

S. dejeani, Ramb. Tangier: not rare. Gibraltar: one specimen, in flood refuse, in the Dockyard, April 1887; abundantly at Algeciras, March 1889, under stones on stiff clay soil. Runs very rapidly when disturbed (*Walker*).

S. jenissoni, Dej. Tangier: common. Gibraltar: under stones, common and widely distributed, winter and spring. Same habits as preceding.

S. depressa, F. (*europæa*, Dej.). Tetuan and Ceuta: not rare. Gibraltar: one specimen, in flood refuse, April 1887. Found near Malaga by Rambur.

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DITOMUS, Bon. (ARISTUS, Latr.).

D. clypeatus, Rossi. Tangier. Gibraltar: under stones, in winter, not rare.

D. sphærocephalus, Oliv. Tetuan, Tangier. Gibraltar, Algeciras: with the preceding, but commoner.

CARTERUS, Dej., Bedel.

C. cephalotes, Dej. Tetuan, Tangier: not rare. Gibraltar: near San Roque, in winter, scarce. This and the other species of the genus live in vertical burrows under stones, and are most partial to the stiffest clay soil (*Walker*).

C. tricuspidatus F. Tetuan: plain of Buzaghal, common. Gibraltar: near Campamento, a few specimens.

C. interceptus, Dej. Gibraltar: in plenty, foot of Sierra Carbonera, in spring. Occurs in Marocco, Algeria, &c.

C. dama, Rossi. Tangier: rare. A Mediterranean species.

C. rotundicollis, Ramb. Tetuan, Tangier, Gibraltar: not rare.

C. fulvipes, Latr. Tetuan. Gibraltar: not rare, in winter, near Campamento. The only N. African capture mentioned by M. Bedel is Mr. Walker's.

C. microcephalus, Ramb. Tetuan, Tangier. Gibraltar: sparingly, in winter, at the foot of the Sierra Carbonera.

C. gracilis, Ramb. Tetuan, Tangier. Gibraltar: in flood refuse, near Campamento.

ERIOTOMUS, La Brûl.

E. villosulus, Reiche. Tangier and Gibraltar: a single specimen at each locality.

ACINOPUS, Dej.

A. giganteus, Dej. Gibraltar: two specimens, one at Algeciras and one beyond San Roque. Not known from N. Africa.

A. picipes, Oliv. Malaga: one specimen. Not known from N. Africa.

A. megacephalus, Rossi. Tetuan: not rare. Gibraltar: in flood refuse, &c., in spring, not rare.

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Anisodactylus, Dej.

A. heros, F. Tetuan, Tangier. Gibraltar: in flood refuse, April 1887.

A. binotatus, F. Tetuan: Esmir marsh, a few specimens. A common European species.

A. winthemi, Dej., var. *metallicus*, Bedel. Tetuan: Esmir marsh, two examples. It occurs in the Balearic Is., &c.

A. pœciloides, Steph. Gibraltar: in flood rubbish, one specimen.

Diachromus, Er.

D. germanus, L. Tetuan: Esmir marsh, numerous specimens. Gibraltar: not rare, in wet flood rubbish, Campamento, in January. This species has a very limited distribution in N. Africa.

Harpalus, Latr.

H. punctatostriatus, Dej. Tetuan, Tangier: not uncommon. Gibraltar: in flood refuse, &c., rather common.

H. distinguendus, Duft. Tetuan, Tangier. Gibraltar: Neutral ground, &c., not rare.

H. siculus, Dej. Tangier. Gibraltar: under stones, not rare.

H. oblitus, Dej., var. *patruelis*, Dej. Tetuan, Tangier, Gibraltar: rare.

H. oblitus, Dej., var. *tingitanus*, Fairm. Tetuan, Tangier: one specimen from each locality.

H. litigiosus, Dej. Gibraltar: Neutral ground, under stones, occasional. Not known from Marocco.

H. tenebrosus, Dej. Benzus Bay, Tetuan, Tangier, Gibraltar: rare.

H. attenuatus, Steph. (*consentaneus*, Dej.). Tetuan: four specimens. A well-known European species.

H. sulphuripes, Germ. Tetuan: one specimen. A European species.

H. fulvus, Dej. (*littoralis*, Ramb.). Plain of Buzaghal, Tetuan, and Tangier. Gibraltar: sandy places, not rare.

H. neglectus, Dej. Tangier and Tetuan: common. A well-known European species.

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OPHONUS (Steph.), Bedel.

O. cordicollis, Serv. (*ditomoides*, Dej.). Gibraltar: one specimen. Occurs in N. Africa.

O. rotundicollis, Fairm. Tetuan, Tangier. Gibraltar: common, under stones.

O. quadricollis, Dej. (*laminatus*, Fairm.). Tetuan: one specimen. A Mediterranean species.

O. planicollis, Dej. Tetuan, Tangier. Gibraltar: under stones, Campamento, &c., common. The variety *hispanus* was found at San Roque by Rambur.

O. puncticollis, Payk. Gibraltar: a few specimens. M. Bedel possesses an example of this species from Tangier.

O. subquadratus, Dej. (*meridionalis*, Dej., *discicollis*, Waltl). Gibraltar: common, under stones. Occurs in N. Africa.

O. pumilio, Dej. Tetuan, Tangier, Gibraltar: under stones, &c., not rare.

O. rupicola, Sturm (*subcordatus*, Dej.). Tangier: a few specimens. A widely-distributed European species.

SCYBALICUS, Schaum.

S. oblongiusculus, Dej. Gibraltar: a few specimens, in flood rubbish and under stones on clay soil, April. Occurs in Marocco and Algeria.

STENOLOPHUS, Latr.

S. teutonus, Schrank. Tetuan, Tangier: not rare. Gibraltar: in damp places, occasional. Malaga.

S. skrimshiranus, Steph. Tetuan: a few specimens in the Esmir marsh. Gibraltar: in flood refuse, Campamento.

S. proximus, Dej. Tetuan: not rare, in the Esmir marsh. A Mediterranean species.

ACUPALPUS, Latr.

A. marginatus, Dej. Tetuan and Gibraltar: rare, in flood refuse.

A. elegans, Dej. Gibraltar: one specimen, in flood refuse. Occurs in Algeria.

A. piceus, Rott. Tangier: two specimens. A Mediterranean species.

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A. dorsalis, F. Tetuan, Tangier, Gibraltar: in damp places, occasional.
A. brunnipes, Sturm. Tetuan, Tangier, Gibraltar: sparingly, in damp places.

DICHIROTRICHUS, Duv.

D. obsoletus, Dej. Tetuan. Gibraltar: in flood rubbish, abundant.

BRADYCELLUS, Er.

B. distinctus, Dej. Tetuan and Gibraltar: a few specimens.
B. lusitanicus, Dej. Tetuan, Tangier. Gibraltar: on E. beach, under pieces of wood, common.
B. similis, Dej. Tetuan and Gibraltar: rare.

ZABRUS, Clairv.

Z. piger, Dej. Tangier, Tetuan. Gibraltar: chiefly on Neutral ground, common.

AMARA, Bon.

A. ænea, De Geer (*trivialis*, Gyll.). Tetuan, Tangier. Gibraltar: on walls, pathways, under stones, &c., common.
A. fervida, Coq. Tangier. Gibraltar: under stones, Campamento, not rare.
A. montana, Dej. (*distincta*, Ramb.). Gibraltar: one specimen. Not known from Marocco.

PŒCILUS, Chaud.

P. dimidiatus, Oliv. Gibraltar: under stones and on pathways, not rare. Not recorded from Marocco.
P. crenulatus, Dej. Gibraltar: in damp places and in flood refuse, not rare.
P. crenulatus, Dej., var. *mauritanicus*, Dej. Tetuan and Tangier: not rare.
P. quadricollis, Dej. Tetuan: Plain of Buzaghal, abundant. Gibraltar: under stones, &c., not rare.
P. quadricollis, Dej., var. *vicinus*, Levr. Tetuan. Gibraltar: abundant, under stones, &c. Occurs at Tangier.

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P. purpurascens, Dej. (*infuscatus*, Dej., *numidicus*, Luc.). Tetuan, Tangier, Djebel Mousa (Ape's Hill). Gibraltar: under stones, near San Roque, not rare.

P. splendens, Gené. Tetuan, Ceuta. Gibraltar: damp places and in flood refuse, not rare.

P. crenatus, Dej. Tetuan. Gibraltar: under stones, &c., plentiful.

P. bæticus, Ramb. (*planidorsis*, Reitt.). Tangier. Gibraltar.

P. decipiens, Waltl. Tangier. Gibraltar: not rare, under stones, in winter.

P. cupripennis, Chaud. Tangier: in plenty. Confined to N. Africa.

Pterostichus, Bon.

P. elongatus, Duft. Tetuan: not rare, in the Esmir marsh, in flood refuse.

Orthomus, Chaud.

O. quadrifoveolatus, Chaud. (?=*hispanicus*, Dej.). Gibraltar: under stones. Not known from N. Africa.

O. maroccanus, Chaud. Tangier, Tetuan, Djebel Mousa (Ape's Hill). Gibraltar: under stones in waste places, common.

O. barbarus, Dej. Gibraltar: dry waste places, under stones, common. Malaga. Found throughout the whole of N. Africa.

Lagarus, Chaud.

L. vernalis, Panz. Tetuan: one specimen, in the Esmir marsh.

Platyderus, Schaum.

P. montanellus, Graells. Gibraltar, Malaga: rare. Not known from N. Africa.

P. ruficollis, Marsh. Tetuan: one specimen. Gibraltar: under stones, near Algeciras.

P. tenuistriatus, Woll. Tetuan and Ceuta: three specimens. Described by Wollaston from a single specimen found by Crotch at Teneriffe. The insect bears an extraordinarily close resemblance to *Calathus mollis*, which was also found by Mr. Walker at Tetuan.

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STEROPUS, Dej.

S. globosus, F. Tetuan, Tangier, Djebel Mousa (Ape's Hill). Gibraltar: on paths, under stones, &c., Rock, Campamento, &c., common. Malaga.

PERCUS, Bon.

P. politus, Dej. (*stultus*, Rosenh.). Gibraltar: under stones, Campamento, &c., not rare. Not known from N. Africa.

ABACETUS, Dej.

A. salzmanni, Germ. Tangier. Gibraltar: not rare, in the bed of a stream; also in flood rubbish, near Campamento.

LÆMOSTENUS, Bon. (PRISTONYCHUS, Dej.).

L. mauritanicus, Dej. Tetuan, Tangier. Gibraltar: on the Rock and also near San Roque.

L. punctatostriatus, Fairm. Tangier.

L. complanatus, Dej. Tangier, Tetuan. Gibraltar: in the town, occasional.

CALATHUS, Bon.

C. circumseptus, Germ. Tetuan. Gibraltar: locally common, under stones.

C. fuscipes, Goeze, var. *punctipennis*, Germ. Djebel Mousa (Ape's Hill): two specimens. A Mediterranean insect. The var. *latus*, Serv., occurs in Marocco.

C. mollis, Marsh. Tetuan. Gibraltar: dry sandy places, abundant.

CARDIOMERA, Bassi.

C. genei, Bassi. Benzus Bay, Marocco: one specimen. Occurs in Sicily.

PLATYNUS, Bon.

P. fulgidicollis, Er. Tetuan: in plenty in the Esmir marsh. Replaces *P. viridicupreus* on the African side of the Straits.

P. viridicupreus, Goeze. Gibraltar: in abundance on Neutral ground, under stones, after heavy rain, December and January. Not recorded from N. Africa, where it is replaced by *P. fulgidicollis*.

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P. marginatus, L. Tangier, Tetuan. Gibraltar: with the preceding, but scarcer; also in flood refuse.

P. numidicus, Luc. Tetuan, Tangier. Gibraltar: in flood refuse, in spring.

P. niger, Dej. (*dahli*, Preudh. de Borre). Tetuan, Tangier. Gibraltar: common, in flood refuse, Campamento, &c.

P. ruficornis, Goeze (*albipes*, F.). Tetuan. Gibraltar: common, in damp places.

P. dorsalis, Pont. (*prasinus*, Thunb.). Tetuan. Gibraltar: under stones, locally common. Recorded from Tangier.

Olisthopus, Dej.

O. fuscatus, Dej. Tetuan. Gibraltar: on walls, &c., occasionally.

Masoreus, Dej.

M. ægyptiacus, Dej. Gibraltar: dry sandy places, Neutral ground, &c., not rare. Varies a good deal in colour. Also found at Sfax by Mr. Walker in 1874. It is a common species in Tunis and Algeria.

Lebia, Latr.

L. fulvicollis, F. Gibraltar: in tufts and under stones, in winter, rare. Found at Malaga by Rambur. Occurs in N. Africa.

L. cyanocephala, L. Gibraltar: under stones, near Campamento, January. Found at Malaga by Rambur. Occurs in N. Africa.

L. rufipes, Dej. Gibraltar: two specimens, one found on a wall at Rosia in January. Found at Malaga by Rambur. Occurs in Algeria.

Lionychus, Schmidt.

L. albonotatus, Dej. Tetuan: a few specimens, Esmir marsh. Occurs in Spain, France, &c.

Pseudotrechus, Rosenh.

P. mutilatus, Rosenh. Tetuan: Plain of Buzaghal, rare. Tangier. Gibraltar: in nests of *Atta barbara* and *A. capitata*, under stones, sparingly, in November,

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February, and March, near Campamento and San Roque. It has also occurred in flood rubbish in spring near Gibraltar. Rosenhauer's specimens were from Algeciras.

Metabletus, Schmidt.

M. fuscomaculatus, Motsch. Tetuan. Gibraltar: on walls, scarce. Mr. Walker has also taken this species in plenty at Sfax.

M. obscuroguttatus, Duft. Tetuan: Esmir marsh. A common European species.

M. scapularis, Dej. Tangier. Gibraltar: under stones, common.

M. pallipes, Dej. Tetuan. Gibraltar: in flood refuse, Campamento, a few specimens.

M. foveolatus. Dej. (*cupreus*, Waltl). Tetuan, Tangier. Gibraltar: dry places, not rare.

M. myrmidon, Fairm. Gibraltar: one specimen, in rubbish, on Rock, April 1888.

Blechrus, Schaum.

B. minutulus, Goeze (*glabratus*, Duft.). Tetuan. Gibraltar: on walls, &c., common.

B. mauritanicus, Luc. Tangier. Confined to the African side of the Straits.

B. lævipennis, Luc.? Djebel Mousa (Ape's Hill). Gibraltar, Malaga: under stones, on walls, &c.

B. plagiatus, Duft. Tetuan. Gibraltar: on walls, &c., not rare.

Dromius, Schaum.

D. linearis, Oliv. Tetuan. Gibraltar: in tufts of grass, &c., not rare.

D. meridionalis, Dej. Gibraltar: one specimen. Occurs at Tangier, as well as in Algeria.

D. insignis, Luc. Tangier: one specimen.

D. vectensis, Rye. Gibraltar: rare, Sierra Carbonera, in the spring.

D. melanocephalus, Dej. Tetuan. Gibraltar: near Campamento.

Demetrias, Bon.

D. atricapillus, L. Tetuan, Tangier. Gibraltar: in tufts of grass, &c., not rare.

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SINGILIS, Ramb.

S. soror, Ramb. Tangier, Tetuan. Gibraltar: in tufts of grass, winter, not rare, Rock, Campamento, &c. Rambur's specimens were from San Roque, in the bay of Algeciras. This insect has also been found by M. Favier in Marocco, whence another species of the genus has been recorded, viz. *S. maroccana*, Fairm., from Cape Spartel.

S. bicolor, Ramb. Malaga: five examples. Rambur's specimens were found in the environs of Granada. Already recorded from Malaga by Rosenhauer.

TRYMOSTERNUS, Chaud.

T. truncatus, Ramb. Gibraltar: one specimen, under a stone, on the Rock, March 2nd, 1889. Recorded from the Rock of Gibraltar, by Rambur. M. Bedel possesses an example of it from Tangier.

T. reflexicollis, Chaud. Malaga: four specimens, on a hill-side under stones.

CYMINDIS, Latr.

C. axillaris, F., var. *favieri*, Fairm. Tangier: common. The var. *africana*, Chaud., also occurs at Tangier. Both varieties are confined to N. Africa.

C. bætica, Ramb. Gibraltar: three specimens.

CYMINDOIDEA, Lap. (PLATYTARUS, Schaum).

C. bufo, F. (*mauritanica*, Dej.). Tetuan, Ceuta. Gibraltar: under stones in winter, not rare. Recorded from Algeciras and Malaga by Rosenhauer.

C. gracilis, Dej. (*protensa*, Rosenh.). Tetuan, Tangier. Gibraltar: with the preceding, occasional.

POLYSTICHUS, Bon.

P. connexus, Fourcr. (*vittatus*, Brullé). Gibraltar: one specimen, in flood refuse, in the Dockyard, April 1887. Occurs in Algeria.

ZUPHIUM, Latr.

Z. olens, F. Tetuan: not rare, in flood refuse, in the Esmir marsh. A Mediterranean species.

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Z. numidicum, Luc. Tangier, Tetuan. Found with *Z. olens* at Tetuan. Recorded from Algeciras by Rosenhauer.

Z. sp. ? Tangier: one specimen. Not known to M. Bedel. It cannot be referred to either of the N. African species recently described by M. Vauloger (Bull. Soc. Ent. Fr. 1897, pp. 292, 293).

Drypta, Dej.

D. dentata, Rossi. Tetuan: not rare, in the Esmir marsh. Gibraltar: locally common, in damp places, San Roque, Sierra Carbonera, &c. This and the following species are known from Tangier.

D. distincta, Rossi. Tetuan: not rare, in the Esmir marsh. Gibraltar: in flood rubbish, in the spring.

Casnonia, Latr.

C. olivieri, Buq. Tetuan: sparingly, in flood refuse and cut reeds, in the Esmir marsh. A genus not represented in Europe.

Brachynus, Weber.

B. humeralis Ahr. Tetuan: plentiful, in the Esmir marsh. A Western Mediterranean species.

B. exhalans, Rossi. Tetuan: sparingly, with the preceding. A Mediterranean species.

B. immaculicornis, Dej. (*græcus*, Dej.). Tangier. Gibraltar: under stones, scarce.

B. crepitans, L. Tangier, Tetuan. Gibraltar: under stones, common.

B. psophia, Dej. Tetuan. Gibraltar: under stones, &c., not rare.

B. psophia, Dej., var. *plagiatus*, Reiche. Tetuan: not rare. A Mediterranean insect. Not met with at Gibraltar.

B. sclopeta, F. Tetuan. Gibraltar: under stones, in damp places, in winter, common.

B. angustatus, Dej. (*hispalensis*, Ramb.). Tangier. Gibraltar: with the preceding, sparingly.

B. pygmæus, Dej. Tetuan, Tangier. Gibraltar: with the preceding.

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B. pygmæus, Dej., var. *testaceus*, Ramb. Tangier: in plenty. Gibraltar: under stones, in damp places, in winter, Campamento, &c., commoner than the typical form.

PHEROPSOPHUS, Solier.

P. hispanicus, Dej. Gibraltar: in abundance, in the Neutral ground, among roots of rushes in a sandy spot, in January; once, in flood refuse, Campamento. Malaga. Occurs in Marocco.

APTINUS, Bon.

A. displosor, Duf. Gibraltar: in plenty, under stones, in winter, Campamento, &c. Not known from N. Africa.

The following species of Cicindelidæ and Carabidæ known from the North African side of the Straits were not met with by Mr. Walker.

Cicindela littorea, Forsk., var. *goudoti*, Dej. Tangier.
Cicindela melancholica, F. Tangier. Occurs in Andalusia, Sicily, &c.
Scarites eurytus, Fisch. Tangier. Occurs in Spain, Sardinia, &c.
Dyschirius globosus, Herbst, var. *tournieri*, Putz. Tangier.
Cillenus lateralis, Sam. Tangier. Widely distributed in Europe.
Bembidion ephippium, Marsh. Tangier. Widely distributed in Europe.
Bembidion andreæ, F. Tangier. A European species.
Bembidion laterale, Dej. (*callosum* Küst.). Tangier. Widely distributed in Europe.
Anillus silvanoides, Dieck. Tangier. The only locality known for the species.
Aëpus robini, Lab. Tangier. Chiefly confined to the English Channel.
Trechus rufulus, Dej. Tangier. Occurs in Andalusia and Sicily.
Pogonus luridipennis, Germ. Tangier. A European coast species.
Chlænius infantulus, Chaud. Tangier. Recorded from Southern Spain, perhaps in error.

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Oodes helopioides, F. Tangier. A well-known European species.
Eriotomus tomentosus, Dej. Tangier, Tetuan. Occurs in Southern Spain.
Harpalus fuscipalpis, Sturm (*castilianus*, Vuillefr.). Tangier. Occurs in Spain.
Harpalus goudoti, Dej. Tangier. A European species.
Ophonus pubescens, Müll. (*ruficornis*, F.). Tangier. A common European species.
Ophonus femoralis, Coq. (*carteroides*, Fairm., *olcesei*, Fairm.). Tangier. Occurs in Spain.
Bradycellus verbasci, Duft. Tangier. A common European species.
Stenolophus mixtus, Herbst (*vespertinus*, Panz.). Tangier. A well-known European species.
Acupalpus puncticollis, Coq. Tangier.
Acorius ghiliani, Baudi. Tangier. Occurs also in Southern Spain.
Amara subconvexa, Patz. Tangier.
Amara affinis, Dej. (*cottyi*, Coq.). Tangier. Occurs in Spain.
Pterostichus nigerrimus, Dej. Tangier. A European species.
Calathus semisericeus, Fairm. Tangier.
Sphodrus leucophthalmus, L. Tangier. A well-known European species.
Læmostenus algerinus, Gory. Tetuan. A Mediterranean species.
Cymindis setifensis, var. *maroccana*, Reiche. Tangier.
Phlæozetæus mauritanicus, Luc. Tangier.
Singilis maroccana, Fairm. Cape Spartel.
Metabletus foveatus, Fourcr. (*foveola*, Gyll.). Tangier. A common European insect.
Zuphium microphthalmum, Putz. Tangier.
Zuphium vaucheri, Vaul. Tangier.

Staphylinidæ.

Three catalogues of the North-African species of this family of beetles have already been published by M. Fauvel, the third [Rev. d'Ent. v. pp. 9–100 (1886)] including no fewer than 555 species, belonging to 103 genera; and a fourth [Rev. d'Ent. xvi. pp. 237–348 (1897)] is now in course of publication, this latter in-

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cluding also the species inhabiting the Azores, Madeira, the Salvages, and the Canary Islands, but excluding those of Egypt. The Maroccan species enumerated by Quedenfeldt [Beitrage zur Kenntniss der Staphylinen-Fauna von Süd-Spanien, Portugal und Marokko, Berl. ent. Zeitschr. 1884, pp. 351–379] are mentioned by M. Fauvel in his third catalogue: Quedenfeldt's list includes altogether 327 species. Rosenhauer [Die Thiere Andalusiens, pp. 64–88 (1856)] mentions 144 species of Staphylinidæ from Andalusia, including as far inland as the Sierra Nevada. Mr. Walker's collection contains representatives of 237 species, 138 of which are British, some few others (chiefly *Homalota* and *Oxypoda*) being left undetermined at present. These insects, it will be noticed, afford very little data for remarks on geographical distribution, as they are more widely distributed than most Coleoptera—the coprophagous species especially,—and with few exceptions the whole of those enumerated occur on both sides of the Straits, though Mr. Walker did not in every case succeed in finding specimens on each side. The species marked with a * are additions to v. Heyden, Reitter, and Weise's European Catalogue (1891). I am much indebted to M. Fauvel for his assistance in determining most of the critical species, as without his aid the present list could not have been prepared. He has himself included many of Mr. Walker's N. African captures in his fourth catalogue.

Ocalea, Erichson.

O. concolor, Kies. Esmir, Marocco. One specimen. A European species, recorded by Rosenhauer from San Lucar.

O. murina, Er. Gibraltar: in flood refuse, near Campamento, several specimens. Recorded from N. Africa.

Chilopora, Kraatz.

C. longitarsis, Er. Esmir and Malaga.

Apteranillus, Fairm.

**A. dohrni*, Fairm. Tangier: in plenty, under large stones embedded in damp clayey soil, winter and early spring. Gibraltar: one specimen, near the Sierra Lorca. An addition to the European list.

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Oxypoda, Mann.

O. exoleta, Er. Gibraltar: on walls and in flood refuse. Recorded from N. Africa.
O. caloderina, Fauv. Tangier: one example. The type was found at Bône, Algeria.
O. hæmorrhoa, Grav. Tangier and Gibraltar.
O. recondita, Kr. Gibraltar: three specimens, under oak bark, Cork Woods, &c. Recorded from Algeria.
O. lurida, Woll. Tangier: one specimen.
O. nigrina, Wat. Tangier.

Microglossa, Kraatz.

M. suturalis, Sahlb. Gibraltar. Recorded from N. Africa.

Aleochara, Grav.

A. olivieri, Fauv. Tangier and Gibraltar. Recorded from Bône, Algeria, and Spain.
**A. rudella*, Fauv. Tangier and Gibraltar: one example from each locality. Described from a single specimen found by M. Olcese at Tangier. An addition to the European list.
A. clavicornis, Redt. Gibraltar: three specimens. Mr. Walker believes that he found them in the nests of *Aphænogaster testaceo-pilosa*, on the Sierra Carbonera. Recorded from N. Africa.
A. crassiuscula, Sahlb. Tangier and Gibraltar: not rare.
A. tristis, Grav. Gibraltar. Found throughout N. Africa.
A. bipunctata, Oliv. Gibraltar and Tangier.
A. crassa, Baudi (*pulicaria*, Rosenh.). Tangier and Gibraltar: two specimens. Rosenhauer's specimens were found at Cadiz.
A. tenuicornis, Kraatz. Tetuan, Esmir, and Gibraltar. Not rare.
A. puberula, Klug. Gibraltar and Tangier. Not rare.
A. lanuginosa, Grav. Esmir, Marocco. A common European insect.
A. succicola, Thoms. Gibraltar: one specimen.
A. nitida, Grav. Tangier, Esmir, Gibraltar, and Malaga. Common.
A. grisea, Kraatz. Esmir and Gibraltar.

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ASTILBUS, Steph.

A. canaliculatus, F. Malaga. Apparently not recorded from N. Africa.

DINARDA, Mann.

D. nigrita, Rosenh. Esmir and Gibraltar. Found in plenty near Gibraltar, in the nests of *Aphænogaster testaceo-pilosa*. Rosenhauer's specimens were found at Jerez and Malaga. Recorded by Quedenfeldt from Algeciras, Tangier, and Mazagan.

ALEUONOTA, Thoms.

A. læviceps, Bris. Gibraltar: four specimens, including both sexes. Apparently not recorded from Spain.

ALIANTA, Thoms.

A. brucki, Epp. (*porosa*, Fauv.). Gibraltar: one specimen. Recorded from Grenada, Carthagena, Sicily, Algeria, and Tunis.

NOTOTHECTA, Thoms.

N. lævicollis, Rey. Tetuàn, Tangier, and Gibraltar. Found in plenty in ants' nests (*Aphænogaster barbara*), also on walls. Campamento, &c.

HOMALOTA, Mann.

H. elongatula, Grav. Esmir, Tangier, and Gibraltar.
H. gregaria, Er. Tangier and Tetuan. A common European species.
H. longula, Heer. Gibraltar: one example. Recorded from N. Africa.
H. exilis, Er. Gibraltar. Recorded from Mogador.
H. vicina, Steph. Gibraltar. Recorded from N. Africa.
H. oraria, Kr. Gibraltar. Recorded from Algeria.
H. longicornis, Grav. Gibraltar. Recorded from N. Africa.
H. nigritula, Grav. Tangier. A common European species.
H. pertyi, Heer. Gibraltar. Recorded from N. Africa.

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H. atramentaria, Gyll. Gibraltar. Recorded from N. Africa.
H. fungi, Grav. Esmir, Tangier, and Gibraltar.
H. sordida, Marsh. Tangier and Gibraltar.
H. nigerrima, Aubé. Tangier. A European species.
H. amicula, Steph. (*sericea*, Rey.). Gibraltar. Recorded from N. Africa.

TACHYUSA, Er.

T. balteata, Er. Gibraltar: one example. Recorded from N. Africa by Fauvel and Quedenfeldt.
T. ferialis, Er. Esmir and Gibraltar.

MYRMECOPORA, Saulcy.

M. uvida, Er. Esmir, Ceuta, and Gibraltar.

ECHIDNOGLOSSA, Woll.

E. ventricosa, Qued. Gibraltar: in tufts of grass, Campamento, &c., rare. Recorded from Tetuan, Algeciras, and Cordova.

FALAGRIA, Steph.

F. nævula, Er. (*formosa*, Rosenh.). Esmir. Gibraltar: in flood rubbish, Alcadeza Crags, in the Cork Woods. Malaga.
F. sulcata, Grav. Gibraltar. Recorded from N. Africa.
F. obscura, Grav. Esmir, Tangier, Gibraltar, Malaga.

SIPALIA, Rey.

S. plicatella, Fauv. Tangier: four examples. Recorded from Marocco, Algeria, Malta, and Spain.

BOLITOCHARA, Mann.

B. lucida, Grav. Gibraltar: two specimens, under bark, in the Cork Woods. These belong to the dark variety described by M. Fauvel from Algeria.

PHLŒOPORA, Er.

P. reptans, Grav. Gibraltar: under bark, Cork Woods. Apparently not recorded from N. Africa.

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PHYTOSUS, Curt.

P. spinifer, Curt. Tetuan. Occurs also on the Algerian coast, as well as in Europe.
P. nigriventris, Chevr. Tetuan. Recorded from Tangier, as well as from Europe.

PRONOMÆA, Er.

P. rostrata, Er. Gibraltar: in flood refuse, near Campamento, one specimen. Occurs in Algeria, as well as in various parts of Europe.

MYLLÆNA, Er.

M. Kraatzi, Sharp. Esmir and Gibraltar: in flood refuse.
M. intermedia, Er. Esmir: with the preceding. A European species.

OLIGOTA, Mann.

O. pusillima, Grav. Gibraltar. Recorded from N. Africa.

HYPOCYPTUS, Mann.

H. longicornis, Payk. Esmir, Tangier, and Gibraltar.
H. apicalis, Bris. Esmir. A European species.

TRICHOPHYA, Mann.

T. pilicornis, Gyll. Malaga: three specimens. Recorded from Algeria.

HABROCERUS, Er.

H. capillaricornis, Grav. Esmir, Algeciras, and Gibraltar.

LEUCOPARYPHUS, Kr.

L. silphoides, L. Gibraltar: on walls, Linea, &c. Occurs in N. Africa.

TACHINUS, Grav.

T. flavolimbatus, Pand. Gibraltar and Malaga: on walls, in flood refuse, &c. Found throughout N. Africa.

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TACHYPORUS, Grav.

T. hypnorum, F. Tangier and Gibraltar. Occurs in N. Africa.
T. solutus, Er. Gibraltar: flood refuse, Campamento. Occurs in N. Africa.
T. nitidulus, F. Esmir and Gibraltar: on walls, &c.

CONURUS, Steph.

C. pubescens, Payk. Esmir. Gibraltar: under stones and in tufts of grass; also found in St. Michael's Cave, near the summit of the Rock.
C. immaculatus, Steph. Gibraltar. Recorded from Marocco and Algeria.
C. lividus, Er. Esmir and Gibraltar: in flood refuse, tufts of grass, &c.

BOLITOBIUS, Steph.

B. pygmæus, F. Gibraltar: in putrid fungus, First Pine-wood, near San Roque. Recorded from Algeria.

MEGACRONUS, Steph.

M. analis, F. Gibraltar: under stones, rare. Recorded from Marocco.
M. inclinans, Grav. Gibraltar: one specimen, Cork Woods, by sweeping. Recorded from Algeria.

MYCETOPORUS, Mann.

M. splendens, Marsh. Gibraltar and Malaga: on walls, &c. Recorded from N. Africa.
M. brunneus, Marsh. Gibraltar. Recorded from Algeria.
M. reichei, Pand. Esmir. Gibraltar: under stones and on walls, Algeciras, San Roque, and Campamento.
M. splendidus, Grav. Esmir and Gibraltar.

TANYGNATHUS, Er.

T. terminalis, Er. (*varicornis*, Woll.). Esmir, Plain of Buzaghal, Tetuan. Found in numbers in flood refuse. A well-known European species. Quedenfeldt has recorded it from Algeciras.

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ACYLOPHORUS, Nordm.

A. glaberrimus, Herbst (*glabricollis*, Grav.). Tetuan and Gibraltar. In wet tufts and flood rubbish. Recorded from Algeria. Quedenfeldt found two specimens of it at Algeciras.

HETEROTHOPS, Steph.

H. dissimilis, Grav. Esmir, Tangier, and Gibraltar.

QUEDIUS, Leach.

Q. brevicornis, Thoms. Gibraltar: under stones, San Roque.
Q. molochinus, Grav. Tangier, Esmir, and Gibraltar: in flood rubbish, &c.
Q. cinctus, Payk. (*impressus*, Panz.). Gibraltar: on walls. Found throughout Algeria.
Q. maurorufus, Grav. Gibraltar and Malaga: in flood rubbish. Recorded from Tangier.
Q. præcox, Grav. Gibraltar. Recorded from Tangier.
Q. obliteratus, Er. Gibraltar: on walls, three specimens. Recorded from N. Africa.
Q. scintillans, Grav. Gibraltar. Recorded from Tangier, Ceuta, and Tetuan.
Q. semiæneus, Steph. Esmir and Gibraltar.
Q. attenuatus, Gyll. Gibraltar.

CREOPHILUS, Mann.

C. maxillosus, L. Tangier and Gibraltar.

STAPHYLINUS, L.

**S. medioximus*, Fairm. Tetuan. Gibraltar: four specimens, in flood refuse, near Campamento, Jan. 1888. Described originally from Tangier and not included in v. Heyden, Reitter, and Weise's European Catalogue.

OCYPUS, Müll.

O. olens, Müll. Djebel Mousa (Ape's Hill), Marocco. Gibraltar: under stones and on roads, autumn.
O. ophthalmicus, Scop. (*cyaneus*, Payk.). Esmir: two specimens. A European species.

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O. planipennis, Aubé. Esmir marsh, plain of Buzaghal: three specimens. A European species.
O. nigrinus, Lucas. Esmir. Gibraltar: under stones, Campamento. Also found in Algeria.
O. æthiops, Waltl. Benzus Bay, Esmir, and Djebel Mousa, Marocco. Gibraltar.
O. æneocephalus, De G. (*cupreus*, Rossi). Esmir and Gibraltar: under stones, &c.
O. walkeri, Fauv.* Esmir.

CAFIUS, Steph.

C. xantholoma, Grav. Esmir, Tangier, and Gibraltar.
C. sericeus, Holme. Esmir and Gibraltar.

ORTHIDUS, Rey.

O. cribratus, Er. Esmir marsh, plain of Buzaghal: in plenty, in flood refuse. A South-European coast species.

ACTOBIUS, Fauv.

A. procerulus, Grav. Esmir and Gibraltar: in flood refuse.

PHILONTHUS, Curt.

P. sordidus, Grav. Tangier and Gibraltar.
P. varius, Gyll., var. *bimaculatus*, Grav. Gibraltar: two specimens. Recorded from N. Africa. Also found at Algeciras by Quedenfeldt.
P. fenestratus, Fauv. Esmir. A European species.
P. ebeninus, Grav. Esmir, Tangier, Gibraltar, and Malaga: common.
P. varians, Payk. Gibraltar and Malaga: on walls, &c. Recorded from N. Africa.
P. agilis, Grav. Tangier. A European species.
P. longicornis, Steph. Gibraltar. Recorded from N. Africa.
P. discoideus, Grav. Gibraltar. Recorded from N. Africa.
P. ventralis, Grav. Malaga. Recorded from N. Africa.
P. micans, Grav. Esmir marsh.
P. dimidiatipennis, Er. Esmir marsh: in plenty in flood refuse. Also occurs in Southern Europe.

* M. Fauvel's description of this species will be published in the supplement to his Fourth N. African Catalogue. The name is taken from his list (p. 297).

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P. quisquiliarius, Gyll. Tangier, Esmir, and Gibraltar: common.
P. alcyoneus, Er. Gibraltar: one specimen. Also occurs in N. Africa.
P. virgo, Grav. Esmir marsh: two specimens. A European species.
P. nigritulus, Grav. Tangier and Gibraltar, common.
P. punctus, Grav. Esmir marsh: five specimens. Recorded from Algeria, as well as from Europe.

Othius, Steph.

O. paralleliceps, Qued. Gibraltar: on road to Sierra Lorca, six specimens. Recorded by Quedenfeldt from Tetuan and Algeciras.
O. læviusculus, Steph. Gibraltar: two specimens. Recorded from N. Africa.

Leptacinus, Er.

L. parumpunctatus, Gyll. Tangier and Gibraltar.
L. batychrus, Gyll. Tangier. A well-known European species.
L. linearis, Gyll. Gibraltar.

Leptolinus, Kr.

L. nothus, Er. Esmir, Tangier, and Gibraltar: in plenty in flood refuse, tufts of grass, &c. The variety with reddish elytra occurred on both sides of the Straits, in about equal numbers with the dark form.

Nudobius, Thoms.

N. collaris, Er. Gibraltar: one specimen, under loose bark of an old oak,* Alcadeza Crags, March 1888. Recorded from Algeria, from under bark of cork-oak, by M. Fauvel. Possibly an addition to the Spanish list.

Xantholinus, Serv.

X. glabratus, Grav. Tangier, Esmir, and Gibraltar.
X. fulgidus, F. Tangier, Esmir, and Gibraltar.
X. translucidus, Scriba. Tangier, Esmir, and Gibraltar: five specimens.

* Found under beech-bark, in Corsica, by myself.

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X. elegans, Ol. Gibraltar: under stones, in plenty, Campamento. Apparently not recorded from N. Africa. Found singly at Algeciras by Quedenfeldt.

X. rufipes, Luc. Gibraltar: one specimen, on the Rock, Jan. 1889. Recorded from N. Africa and Spain.

X. græcus, Kr. Tangier. Occurs in Algeria, as well as in S. Europe.

X. hesperius, Er. Tangier and Gibraltar: under stones, on walls, &c., not rare.

X. linearis, Grav. Esmir, Gibraltar, and Malaga: with the preceding.

Cryptobium, Mann.

C. fracticorne, Payk., var. *jacquelini*, Boield. Esmir and Gibraltar. Found in plenty in flood refuse in the Esmir marsh. All the specimens have a reddish thorax.

Dolicaon, Lap.

D. nigricollis, Woll. (*artus*, Karsch). Gibraltar: one example, determined as *D. nigricollis*, Woll. (a species not recognised as European), by M. Fauvel. It differs from Wollaston's types, from the Canary Is., in being larger, and in having the punctures on the head and thorax finer, and those on the hind body coarser. *D. nigricollis* has been recorded by Quedenfeldt from Tripoli.

D. cribricollis, Fauv. Tangier: not rare. Also occurs in Spain.

D. gracilis, Grav. Esmir and Ceuta. Found in numbers in the Esmir marsh. Occurs in Spain, Portugal, &c.

D. biguttulus, Luc. Gibraltar: under stones, near Campamento, occasional. Recorded from N. Africa.

Lathrobium, Grav.

L. anale, Luc. Esmir, Tangier, and Gibraltar. Found in some numbers in the Esmir marsh.

L. angustatum, Lac. Gibraltar: wet places, Campamento. Recorded from Tangier.

L. labile, Er. Esmir: one specimen, with the preceding. A European species.

L. dividuum, Er. Esmir: one specimen. Occurs in Algeria, as well as in Europe.

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ACHENIUM, Curt.

A. rugipenne, Fauv. Esmir, Ceuta, and Gibraltar. Found in flood refuse in the Esmir marsh. Described from Spanish specimens.

A. planum, Er. Esmir: two specimens, with the preceding. A European species.

A. striatum, Latr. Tangier, Esmir, and Gibraltar: under stones, in flood refuse, &c.

A. depressum, Grav. Gibraltar: under stones, Campamento. Recorded from Algeria.

A. rufulum, Fairm. Gibraltar: one specimen. Apparently not recorded from N. Africa.

A. brevipenne, Qued. Tangier: rather common. Not recorded from Europe. Quedenfeldt's specimens were from Tangier and Aseila.

A. nigriventre, Fairm. Esmir marsh: four specimens. Recorded from Tangier, as well as from Europe.

A. tenellum, Er. Esmir and Gibraltar: not rare in wet places.

SCIMBALIUM, Er.

S. pubipenne, Fairm. Esmir and Gibraltar: in flood refuse, &c., not rare.

S. scabrosum, Fauv. Tangier and Esmir: in plenty in flood refuse. Apparently confined to Marocco.

S. testaceum, Er. Esmir. Gibraltar: under stones, &c., in damp places, Campamento, Sierra Carbonera.

MEDON, Steph.

M. piceus, Kr. Gibraltar: in flood refuse, five specimens. Not recorded from N. Africa.

M. ripicola, Er. Gibraltar and Malaga. Occurs also in N. Africa.

M. apicalis, Kr. Esmir marsh: one specimen. Recorded from Algeria. Found at Algeciras by Quedenfeldt.

M. obsoletus, Nordm. Gibraltar: in flood refuse. Recorded from Algeria.

M. simoni, Qued.* Esmir, Tangier, and Gibraltar: six specimens. Found in nests of *Aphænogaster barbara* at Gibraltar, near Campamento, January 1888.

* Recorded by Mr. Walker in Ent. Monthly Mag. XXV. p. 377, under the name *M. seminiger*, Fairm.

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M. nigritulus, Er. Esmir and Gibraltar: in flood refuse, tufts of grass, &c., common.
M. propinquus, Bris. Esmir, Gibraltar, and Malaga: in tufts of grass, &c.
M. ochraceus, Grav. Gibraltar and Malaga. Occurs throughout N. Africa.

SCOPÆUS, Er.

S. lævigatus, Gyll. Esmir marsh: three specimens. Occurs in Algeria, as well as in Europe. Found at Malaga by Quedenfeldt.
S. gracilis, Sperk. Esmir and Gibraltar: in flood refuse, three specimens.
S. minimus, Er. (*sulcicollis*, Quedenf.). Esmir and Gibraltar: two specimens.

STILICUS, Latr.

S. orbiculatus, Payk. (*affinis*, Er.). Esmir, Gibraltar, and Malaga.

SUNIUS, Steph.

S. collaris, Fauv. Tangier and Esmir: in flood refuse, &c. Occurs also in Spain. Recorded from Algeciras by Fauvel.
S. latus, Rosenh. Gibraltar: under stones, occasional. One of these specimens has been named *S. collaris* by M. Fauvel; but it differs from the Maroccoan examples in being larger and darker, and in having the upper surface more coarsely punctured. Found at Cadiz by Rosenhauer.
S. filum, Aubé. Tangier and Gibraltar: not rare, under stones and in tufts of grass.
S. filiformis, Latr. Tangier: one specimen. A European species.
S. uniformis, Duv. Gibraltar: four specimens. Occurs in N. Africa.
S. melanurus. Küst. Gibraltar: one specimen. Widely distributed in N. Africa, as well as in Europe.
S. bimaculatus, Er. Esmir and Gibraltar: under stones and in tufts, not uncommon.
S. angustatus, Payk. Tangier and Gibraltar.

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NAZERIS, Fauv. (MESUNIUS, Sharp).

N. pulcher, Aubé. Gibraltar: nine specimens, in flood refuse, San Roque, March 1888 and January 1889. Occurs in Marocco and Algeria, as well as in Spain and Portugal.

PÆDERUS, Grav.

P. meridionalis, Fauv. Esmir, Gibraltar, and Malaga: not uncommon in tufts of grass, &c.

P. caligatus, Er. Esmir, Gibraltar, and Malaga: in flood refuse, rather common.

P. ruficollis, F. Esmir and Gibraltar.

ŒDICHIRUS, Er.

Œ. pæderinus, Er. Tangier: common. Also occurs in Sicily, Algeria, &c.

Œ. unicolor, Aubé. Gibraltar: plentifully under stones, in dry tufts, &c., Campamento. Hitherto a rare European insect. Recorded from Tangier. Found singly at Algeciras by Quedenfeldt.

Œ. terminatus, Er., var. *walkeri*, Fauv.* Tetuan: five examples—one from flood refuse in the Esmir marsh, a few miles to the north of Tetuan, and four from dry flood rubbish on the banks of the Bús-feka or Kús River, five miles below the town of Tetuan; these latter were taken on March 4th, 1888. M. Fauvel states that *Œ. terminatus* is spread from Caramania (Asia Minor) to Delagoa Bay.

PROCIRRUS, Latr.

P. lefebvrei, Latr. Esmir marsh, sparingly, in flood refuse. Recorded from Sicily and Algeria. Found at Tangier by Quedenfeldt.

PINOPHILUS, Grav.

P. siculus, Er. Esmir marsh, plentifully, with the preceding. Recorded from Sicily and Algeria. Not met with by Quedenfeldt.

* Rev. d'Ent. 1897, p. 271.

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DIANOUS, Samouelle.

D. cœrulescens, Gyll. Malaga. Not recorded from N Africa.

STENUS, Latr.

S. guttula, Müll. Esmir and Gibraltar: in flood refuse, rare.
S. providus, Er. Tetuan and Gibraltar: in flood refuse.
S. intricatus, Er. Esmir marsh: not rare. A European species. Found near Granada by Rosenhauer.
S. languidus, Er. Esmir and Gibraltar: five specimens.
S. melanopus, Mann. Esmir and Gibraltar: found in numbers in the Esmir marsh.
S. mendicus, Er. Esmir and Gibraltar: not rare.
S. nigritulus, Gyll. Gibraltar: in flood refuse, three examples. Recorded from Algeria.
S. similis, Herbst. Esmir and Gibraltar.
S. canescens, Rosenh. (*major*, Rey). Esmir marsh: six specimens. A European species. Found at Algeciras by Rosenhauer.
S. pallitarsis, Steph. Esmir: one specimen. A European species, occurring also in Algeria.
S. paganus, Er. Esmir marsh: seven examples.
S. fornicatus, Steph. Esmir: one specimen. A well-known European species. Mr. Walker's is the only recorded N. African capture.
S. cordatus, Grav. Gibraltar: one specimen. Recorded from Algeria. Found in Spain by Rosenhauer.
S. elegans, Rosenh. Gibraltar: one specimen. Recorded from Algeria. Found at Algeciras by Rosenhauer.
S. ærosus, Er. (*annulatus*, Crotch). Gibraltar: three specimens. Recorded from Algeria.
S. flavipes, Steph. Gibraltar: one specimen. Recorded from Algeria.

PLATYSTETHUS, Mann.

P. spinosus, Er. Tangier, Esmir, and Gibraltar: not rare, in dung, flood refuse, &c.
P. alutaceus, Thoms. Esmir: two male specimens, with the elytra coloured as in *P. cornutus*, Grav.

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P. capito, Heer. Gibraltar: four specimens, in flood refuse, Sierra Carbonera, &c. Recorded from N. Africa.

P. nitens, Sahlb. Tangier and Esmir: numerous examples. A European species.

Oxytelus, Grav.

O. piceus, L. Tangier, Esmir, and Gibraltar: in dung and flood refuse.

O. sculpturatus, Grav. Gibraltar and Malaga. Occurs throughout Marocco.

O. sculptus, Grav. Gibraltar: on walls, Campamento. Occurs in Algeria and Marocco.

O. complanatus, Er. Gibraltar. Occurs throughout Marocco.

O. inustus, Grav. Esmir and Gibraltar: in dung.

O. plagiatus, Rosenh. Gibraltar and Malaga: in dung. Occurs in N. Africa. Found at Cadiz by Rosenhauer.

O. brevipennis, Fauv. Tangier and Gibraltar.

O. nitidulus, Grav. Gibraltar. Occurs throughout N. Africa.

O. speculifrons, Kr. Tangier: one specimen. A European species. Recorded from Ceuta.

Bledius, Mann.

B. taurus, Germ. Esmir: one specimen. A well-known European species. Found at Cadiz by Rosenhauer, and at Tangier by Olcese.

B. spectabilis, Kr. Esmir and Gibraltar: found in numbers at Esmir.

B. verres, Er. Gibraltar: not rare. Recorded from Marocco, Tunis, &c.

B. fossor, Heer. Gibraltar: sandy places, near Linea, not rare. Recorded from N. Africa.

B. unicornis, Germ. Esmir: not rare. A European species.

B. corniger, Rosenh. Tangier: one specimen. Found at Cartama, Spain, by Rosenhauer.

B. debilis, Er. Esmir and Gibraltar: in banks of streams and pools, burrowing in the sand, common.

B. arenarius, Payk. Esmir: four specimens. A European species.

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TROGOPHLŒUS, Mann.

T. bilineatus, Steph. Tangier and Gibraltar: not rare, in flood refuse, &c.

T. corticinus, Grav. Esmir and Gibraltar: in flood refuse, &c.

T. punctipennis, Kies. Esmir: one example. A European species.

T. nitidus, Baudi. Esmir: one example. A European species.

ANCYROPHORUS, Kr.

A. angustatus, Er. Esmir and Malaga. Occurs also in Algeria.

A. homalinus, Er. (*venustulus*, Rosenh.). Esmir, Gibraltar, and Malaga: in flood refuse, &c.

COMPSOCHILUS, Kr.

C. filiformis, Qued. (*rosti*, Reitt.). Tangier and Gibraltar: one specimen from each locality; the second was found on the bare sand hills beyond Linea. Found singly at Algeciras by Quedenfeldt. Also recorded from the Ionian Islands.

HOMALIUM, Grav.

H. rivulare, Payk. Malaga. Recorded from Algeria.

H. allardi, Fairm. Gibraltar: in decaying poplar bark, San Roque, and on a wall, at Campamento. Recorded from N. Africa.

H. vile, Er. Gibraltar: under bark and in fungus, Cork Woods. Recorded from N. Africa.

H. striatum, Grav. Gibraltar: in putrid boleti, First Pine wood, three specimens. Not recorded from N. Africa.

ANTHOBIUM, Steph.

A. minutum, F. Gibraltar: on flowers, in spring, common. Recorded from Tangier.

PROTINUS, Er.

P. atomarius, Er. Gibraltar: in fungus, Cork Woods, also on the Rock. Recorded from N. Africa.

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PHLŒOBIUM, Er.

P. clypeatum, Müll. Gibraltar: in flood refuse, Sierra Lorca, April 1888. Recorded from N. Africa.

MICROPEPLUS, Latr.

M. porcatus, Payk. Tangier and Gibraltar.
M. staphylinoides, Marsh. Gibraltar. Recorded from Algeria.

The following additional species are recorded from the Maroccan side of the Straits by M. Fauvel, in his Fourth Catalogue, so far as published. This adds 67 species to Mr. Walker's list, 38 of which are British.

Gnypeta carbonaria, Mann. Tangier.
Homalota plumbea, Waterh. Tangier and Ceuta.
„ *cæsula*, Er. Tangier.
„ *triangulum*, Kr. Tetuan.
„ *soror*, Kr. Tangier.
„ *africana*, Fauv. Tangier.
„ *rugata*, Fauv. Tangier.
„ *trinotata*, Kr. Tetuan.
„ *oblita*, Er. Tangier.
„ *inermis*, Fauv. Tangier.
„ *minor*, Aubé. Tangier.
„ *zosteræ*, Thoms. (*nigra*, Kr.). Marocco generally.
„ *macrocera*, Thoms. Tangier.
„ *aterrima*, Grav. Tetuan.
„ *pulchra*, Kr. Tangier.
„ *melanaria*, Mann. Tangier.
„ *fuscipes*, Heer. Tangier.
„ *parva*, Sahlb. Tangier.
Myrmecopora sulcata, Kies. Tangier and Ceuta.
Myllæna gracilicornis, Fairm. Tangier.
„ *græca*, Kr. Tangier.
„ *brevicornis*, Matth. Tangier and Tetuan.
Oligota inflata, Mann. Tetuan.
„ *punctulata*, Heer. Tangier and Tetuan.
„ *parva*, Kr. Tangier.
„ *pumilio*, Kies. Ceuta and Tetuan.
Hypocyptus unicolor, Rosenh. Tangier and Tetuan.

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Conurus monticola, Woll. Tangier.
Mycetoporus angularis, Rey. Tangier.
Bolitobius exoletus, Er. Tangier.
Euryporus æneiventris, Luc. Tangier.
Quedius abietum, Kies. Tangier.
„ *iridicolor*, Qued. Tetuan.
„ *duplex*, Fauv. Tetuan.
Leistotrophus marginalis, Gené. Tangier.
Ocypus obscuroæneus, Fairm. Tangier.
„ *ater*, Grav. Tangier.
„ *bellicosus*, Fairm. Tangier.
Philonthus intermedius, Luc. Marocco generally.
„ *politus*, L. Tangier.
„ *fimetarius*, Grav. Tetuan.
„ *hesperius*, Fauv. Tangier.
„ *thermarum*, Aubé, var. *maritimus*, Motsch. Tangier.
Othius pilifer, Qued. Tetuan.
Xantholinus punctulatus, Payk. Marocco generally.
Dolicaon densiventris, Fauv. Marocco generally.
„ *illyricus*, Er. Marocco generally.
Lathrobium lusitanicum, Er. Tangier.
Medon despectus, Fairm. Tangier.
„ *ovaliceps*, Fauv. Tangier.
Scopæus longicornis, Fauv. Tangier and Tetuan.
„ *didymus*, Er. Tangier.
Pæderus fuscipes, Curt. Marocco generally.
Stenus ater, Mann. Marocco generally.
„ *pusillus*, Steph. Tangier.
„ *tarsalis*, Ljungh. Tangier.
„ *picipennis*, Er. Tangier.
Platystethus oxytelinus, Fauv. Tangier.
„ *cornutus*, Grav. Marocco generally.
Oxytelus intricatus, Er. Tangier.
„ *pumilus*, Er. Tangier.
„ *tetracarinatus*, Block. Tangier.
Trogophlœus exiguus, Er. Tangier.
Compsochilus curtipennis, Fauv. Tangier.
Lesteva fontinalis, Kies. Tangier.
Protinus brachypterus, F. Tangier and Tetuan.
Pseudopsis sulcata, Newm. Tangier.

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VI. *Descriptions of New Species of American Rhopalocera.*

By F. Du Cane Godman, F.R.S., and Osbert Salvin, M.A., F.R.S.

[Read February 2nd, 1898.]

We have long felt the inconvenience of having a number of unnamed species of Rhopalocera in our collection and the consequent difficulty of referring to them. We propose in this and similar papers to describe such species as require names and when necessary to give figures of the more notable forms.

We begin with the American Ithomiinæ, which require a good deal of attention.

Tithorea furina, sp. n.

T. furiæ, Staud. similis sed fascia anticarum mediana omnino maculosa distinguenda.

Hab. Colombia.

This is a form of *T. furia*, Staudinger, but it differs in having the band, which crosses the middle of the primaries through the end of the cell to the middle of the outer margin, split up into six separate small spots. In *T. furia* these are partially run together and form a broken band.

We have six specimens including both sexes, most of them obtained by the late T. H. Wheeler during his travels in the interior of Colombia. One specimen was unnamed in Bates's collection.

Tithorea flacilla, sp. n.

T. furiæ quoque similis sed quoad maculis anticarum *T. furinæ* proxima, anticis ad basin fere omnino nigris; fascia posticarum mediana nigra margine externo conjuncta, maculis tribus flavidis ad angulum apicalem differt.

Hab. Colombia.

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This seems to be another distinct form of this section of *Tithorea*. It has blacker bases to the primaries, almost as in *T. irene*, with narrow longitudinal fulvous streaks. There is a strong black transverse band on the secondaries, which joins the black outer margin near the apical angle, where there are three yellow spots.

One of our specimens is from the Valley of the Cauca; three others from Wheeler's collection but without record of the place of capture.

Tithorea hermias, sp. n.

T. megaræ, Godt. affinis, sed maculis omnibus anticarum minoribus ad basin fulvescentioribus; posticis fulvis, fascia mediana maculosa marginem externum ad angulum apicalem haud attingente, margine externo angusto.

Hab. ECUADOR, Sarayacu, Cururai, Gualaquiza (*Buckley*).

The narrow black border of the secondaries of this form seems to render it distinct from its near allies, of which the species of Guiana and the Lower Amazons which used to pass as *T. megara* of Godart, and Mr. Butler's *T. egaensis* are the nearest. The black transverse band of the secondaries is narrow and, in most cases, broken up into spots, some specimens having as few as two, others three or four.

We have eight specimens from various parts of Ecuador.

Tithorea parola, sp. n.

T. hecalesinæ, Feld. similis et forsan vix distinguenda, area mediana posticarum fulva multo magis extensa, area costali tantum nigra.

Hab. COLOMBIA, Cauca Valley.

This is probably the Cauca-Valley form of *T. hecalesina*, the types of which came from the neighbourhood of Bogota. The sole difference is in the greater extension of the fulvous colour of the secondaries towards the costal margin, which alone shows a black border. The black spot near the apical angle is more distinct.

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We have four specimens of this form.

Melinæa crameri, sp. n.

Papilio mneme, Cramer. Pap. Ex., Pl. 190, fig. C. (*nec* Linn.)

Cramer's figure of what he supposed to be *P. mneme* of Linnæus clearly refers to a very different species. This is shown distinctly by five specimens from Guiana in our collection, four of which were sent us from British Guiana by Henry Whitely.

The differences consist in *M. crameri* having two black spots in the middle of the cell of the primaries instead of a comma-shaped spot extending towards the base. The base of the secondaries is fulvous and there is no definite fulvous subcostal stripe. The inner margin of the primaries is fulvous almost throughout its length, instead of black.

Melinæa egesta, sp. n.

M. menophilo (Hew. Ex. Butt. *Mechanitis* 1, fig. 3, *nec* 2) similis, sed anticis apice nigro maculis tribus in linea obliqua flavis notato.

Hab. COLOMBIA; E. PERU.

We have four specimens of this *Melinæa*, two from Wheeler's collection from the interior of Colombia, and two from Dr. Staudinger, to whom they were sent by Hahnel from Yurimaguas in Eastern Peru. The species is closely allied to *M. menophilus*, Hew., of Colombia and Ecuador as regards its chief markings, but may at once be distinguished by the yellow apical spots on the primaries.

Melinæa macaria, sp. n.

M. menophilo quoque similis, sed anticis ad apicem flavo-maculatis ut in *M. egesta*, posticis plerumque nigris, margine externo et fascia subcostali tantum fulvis.

Hab. COLOMBIA.

Five specimens, of which three are from San Martin in

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the Llanos of the Rio Meta on the eastern side of the Andes.

In the markings of the primaries this form almost exactly resembles *M. egesta*, but the black of the secondaries is concentrated into one patch instead of forming a double row of black spots.

Methona psamathe, sp. n.

M. confusæ, Butl. (*M. psidii*, Bates *ex* Cramer, *nec* Linn.) affinis et forsan forma geographica, fascia per cellulæ medium obsoleta et fasciis per cellulas alarum angustis distinguenda.

Hab. ECUADOR, Gualaquiza.

A name for this form of *Methona confusa* seems desirable, as its peculiarities are closely followed by a form of *Dysmathia orise* (Bdv.) found in the same districts.

We have four specimens, two of which were in the collection of the botanical collector R. Pearce, who took them at Gualaquiza in Eastern Ecuador.

Thyridia colombiana, sp. n.

T. ædesiæ similis sed maculis omnibus fulvis multo pallidioribus et magis hyalinis, parte inferiore maculæ subapicalis partim disjuncta, fascia per cellulam posticarum integra sat lata ad marginem externum paulo constricta.

Hab. COLOMBIA, Rio Meta.

We have long had a specimen of a *Thyridia* allied to *T. ædesia* which does not quite agree with our series of that species. The fulvous spots are more transparent, the subapical spot of the primaries is nearly entire and not divided, and a complete band crosses the secondaries through the end of the cell.

From *T. pallida* it differs in having the subapical spot of the primaries larger, and its inner edge much more broken; the black colour over the second submedian segment is wider.

Our specimen was obtained on the eastern side of the Andes of Bogota which is drained by the Rio Meta.

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Thyridia pallida, sp. n.

T. ædesiæ affinis sed maculis omnibus fulvis multo pallidioribus semidiaphanis, plaga anticarum subapicali integra ut in *T. pythone*, Feld., fascia transversa posticarum quoque integra sed angusta.

Hab. BRAZIL, Matto Grosso.

Mr. Herbert H. Smith's collection from Chapada, Matto Grosso, contained a series of specimens of this *Thyridia*, which to some extent combine the characters of *T. ædesia* and *T. pytho*, a near ally of *T. psidii*. The fulvous marks are paler and more transparent than in *T. ædesia*. The subapical spot of the primaries is entire, the lower portion not being separated by a black band from the rest. There is no definite black spot at the end of the cell, but a narrow black line passes through the end of the cell and joins the outer border. In the arrangement of the black markings of the wings this species closely follows *T. pytho*, but the colour of the semitransparent marks at once separates it from that species.

Mechanitis equicoloides, sp. n.

Alis anticis ad basin fulvis, ad apicem nigris, macula subapicali, fascia transversa irregulari discali flavis, macula rotunda in cellula altera inter ramos medianos primo et secundo nigra, vena submediana ad basin nigra, margine externo punctis sex albis notato ; posticis maculis duabus, una cellulari altera ultra eam, nigris fascia mediana valde irregulari fere maculosa quoque nigra margine externo nigro introrsum irregulari, punctis tribus albis includente : subtus ut supra punctis albis submarginalibus magis distinctis et magis numerosis (in anticis novem in posticis septem) ; posticis macula nigra ad basin cellulæ.

Hab. ECUADOR, PERU.

Dr. Staudinger has sent us from time to time several specimens of this species with the MS. name of *M. equicoloides* attached to them, a title we now adopt. They are from Saõ Paulo, Olivencia and Yurimaguas. We have

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also a specimen obtained by E. Bartlett on the Huallaga River, and others from Ecuador collected by Buckley at Cururai. In all ten specimens.

Mechanitis sylvanoides, sp. n.

Præcedenti similis et marginibus externis alarum quoque albo punctatis; posticis autem fascia mediana et margine externo nigris confluentibus, anticis area ad cellulæ finem flavo tincta.

Hab. GUIANA.

A Cayenne specimen sent us some years ago by Deyrolle belongs to this form, and two others of uncertain origin from the Kaden collection agree with it.

The resemblance of this *Mechanitis* to *Heliconius sylvana* is great, the two insects being homœochromatic.

Callithomia butes, sp. n.

C. thornaci similis et forsan vix distinctas, alis anticis area apicali maculis flavis plerumque notata, posticis margine externo late nigro introrsum distincte dentato, fascia maculosa mediana magis distincta.

Hab. ECUADOR, Rio Napo.

We have fourteen specimens of a species of *Callithomia* which seems to be distinct from the single type of Bates's *C. thornax*, inasmuch as the apical area of the primaries is always marked with large spots of either yellow or fulvous, the former predominating.

Our series came from one collection made somewhere in the district of the Lower Napo, and they all have the prevalent fulvous tints peculiar to so many butterflies of that region; as is usual the amount of variation between individuals is considerable.

Callithomia procne, sp. n.

Alis anticis ad basin fulvis apicibus nigricantibus nigris fascia lata flava per cellulæ finem a costa ad angulum analem extendente,

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cellulæ finem ipsam et ramum medianum secundum ad basin fulvis, maculis duabus nigris una ad cellulæ finem apud venam subcostalem altera inter venam medianam et ramum suum secundum tertia indistincta ad medium cellulæ; posticis fulvis, maculis tribus infra cellulam et margine externo apud angulum analem nigris: subtus anticis ut supra macula in cellula magis distincta; posticis fascia subcostali nigra interrupta, maculisque tribus submarginalibus albis ad angulum analem.

Hab. COLOMBIA.

Of this *Callithomia* we have two specimens, both females, one of them from San Martin in the Llanos of the Rio Meta, captured by Mr. G. D. Child. The other was given us by Dr. Semper and came from Sabatoga in Colombia. This specimen differs slightly from the other in that the black of the apex of the primaries reaches quite up the end of the cell, and the yellow cross-band is severed by the second median segment being broadly fulvous.

Callithomia megaleas, sp. n.

Alis anticis nigricantibus ad basin fulvis maculis sex submarginalibus ad costam extendentibus, stria inter venam medianam et ramum suum secundum, et fascia obliqua ultra cellulam flavis, fascia obliqua per cellulam altera inter ramos medianos fulvis: posticis fulvis unicoloribus margine externo angusto nigro: subtus ut supra anticis ad apicem posticis ad apicem et ad angulum analem punctis albis notatis posticis quoque area subcostali nigra.

Hab. PANAMA.

We have a single female specimen of this distinct species which was captured by Mr. Champion near David in the State of Panama.

Callithomia philomela, sp. n.

C. zeurippe, Bates affinis sed alis anticis angustioribus posticis haud semidiaphanis ad angulum apicalem strictissime nigro-limbatis, maculis transversis nigris ad marginem inferiorem cellulæ magis approximantibus: subtus posticis maculis submarginalibus albis

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minoribus ad angulum analem tantum obviis ad angulum apicalem absentibus.

Hab. COLOMBIA.

We have three male specimens of this *Callithomia* taken by Mr. G. D. Child near San Martin in the Llanos of the Rio Meta, on the eastern side of the Andes of Colombia.

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VII. *On some Phytophagous Coleoptera* (Eumolpidæ) *from the Islands of Mauritius and Réunion.* By MARTIN JACOBY, F.E.S.

[Read February 2nd, 1898.]

Monsieur Charles Alluaud of Paris, who spent some weeks in the Islands of Mauritius and Réunion, has kindly submitted to me the Phytophaga he obtained at these places. Some of the species appear to be new to science, and of these I here give the descriptions. But few species from these localities are known at present, and in some instances those which have been described have remained doubtful as to their proper genera, and are wrongly placed in Catalogues.

Those dealt with in this paper all belong to the Eumolpidæ, and it is certainly remarkable that so many different species of one family should be found in such small and isolated localities, a fact which scarcely agrees with Wallace's theories with regard to island faunas; the genus *Trichostola* however is not confined to these islands but is represented in Africa.

The insects described here were obtained at Carepipe in the centre of Mauritius at a height of about 1000 feet, and in the Plaine des Palmistes in the Réunion mountains at an elevation of 3000 feet.

Trichostola (*Acis*) *vestita*, Boh.

Among the Phytophagous Coleoptera described by Boheman in the "*Eugenies* Resa" the present species is one of which the genus has been doubtful and was not known to Chapuis or Lefèvre. The latter writer placed it in *Colasposoma* Cast., which is rather remarkable, since no form of such small size has ever been known of this genus, in species of which a dense pubescence is very uncommon. Curiously enough, Chapuis has described, or rather diagnosed, another *Trichostola* from the same locality

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under the same specific name; as Boheman's name has priority, that of Chapuis cannot remain and I alter it therefore to *Trichostola chapuisi*. This species is described as being flavo-ferruginous, so that it has nothing to do with any of those in the present paper.

Through the kindness of Dr. Aurivillius of the University Museum at Stockholm, I have been enabled to examine Boheman's types, both of *Acis vestita* and *Colaspis puberula*, from the island of Mauritius.

With respect to the first-named species, the type seems different from any of the forms obtained by Mons. Alluaud and described here; it is a true *Trichostola* and has nothing to do with *Colasposoma*. The entire upper surface is densely clothed with pale fulvous pubescence, through which the punctuation can only be seen with difficulty. Boheman gives the colour as "cupreus-æneus," but the specimen sent to me by Dr. Aurivillius is nearly black excepting the shoulders; the punctuation of the head is not distinguishable owing to the pubescence; the antennæ extend rather beyond the middle of the elytra, the first five joints being flavous, the rest fuscous and thickened; the thorax is twice as broad as long, narrowed in front, with strongly rounded sides, its punctuation is again indistinguishable, or extremely fine where traces are visible; that of the elytra consists of closely-placed large punctures, arranged in very close longitudinal striæ; the interstices are clothed with pale pubescence arranged in rows, to the number of about twelve, the shoulders and the sides showing a distinct metallic brassy gloss; the underside is darker obscure-æneous and the legs are fulvous. The length of the insect is $1\frac{3}{4}$ millim.

Trichostola (*Colaspis*) *puberula*, Boh.

This species is much larger than the preceding one (measuring nearly 3 millim. in length), of dark æneous colour. The head is remotely and finely punctured (sparingly pubescent in the specimen before me), the labrum is fulvous; the antennæ are robust, nearly black, the lower three joints dark fulvous, the third and fourth joints equal. The thorax is strongly transverse, widened at the middle, with strongly rounded sides and close and very strong punctuation, which distinguishes this species

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at once from any other of the genus; the interstices are also pubescent, but the specimen seems rather rubbed. The elytra are greenish-cupreous, with a distinct basal depression, and deep and closely-placed punctures in rather regular rows; the interstices have some small punctures here and there and are clothed with fulvous pubescence, rather long and somewhat sparsely distributed in the specimen before me, showing the metallic cupreous-ground colour distinctly; the sides are of a more greenish tint. Underside and legs as in the preceding species.

The thorax in this insect is less narrowed in front than in *T. vestita* and the punctuation is very strong and close; the elytra are also distinctly broader at the base than the thorax, with the shoulders rather projecting, a feature which distinguishes the species at once from any of its allies.

Trichostola aurata, sp. n.

Below black, above reddish-cupreous, clothed with fulvous pubescence, antennæ and legs fulvous; head and thorax finely and closely punctured; elytra finely punctate-striate.

Length, 2—3 millim.

Head closely covered with long fulvous pubescence, very finely punctured, the epistome not separated from the face, labrum and palpi fulvous; antennæ extending nearly to the middle of the elytra, fulvous, the terminal joints gradually and slightly thickened, each joint stained with fuscous at the extreme apex, the third joint as long as the following ones. Thorax twice as broad as long, the sides rounded, the anterior portion rather strongly deflexed at the sides and very obsoletely transversely depressed, the surface clothed like the head with long fulvous pubescence directed towards the base, scutellum covered with long whitish hairs. Elytra a little wider at the base than the thorax, with a slight transverse basal depression, finely but distinctly punctate-striate, pubescent like the other parts. Underside black, sparingly clothed with grey pubescence, legs entirely fulvous; prosternum very broad.

Hab. MAURITIUS, Carepipe.

This little species is at once distinguished by the bright metallic reddish-cupreous colour, and by the fulvous, and not grey, pubescence of the upper surface, which nearly obscures all punctuation except that of the elytra.

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Trichostola striatipennis, sp. n.

Greenish-æneous, clothed with fulvous pubescence, below black, the basal joints of the antennæ, and the legs fulvous; thorax extremely finely and closely punctured; elytra with strongly punctured striæ, the interstices finely and sparingly punctured, slightly convex.

Length, 2 millim.

Clothed, like the preceding species, over all the upper surface with fulvous pubescence, obscuring the punctuation of the head and thorax; the labrum and the lower four joints of the antennæ fulvous, the other joints black and strongly thickened. Thorax about twice as broad as long, sides rounded and strongly deflexed anteriorly, punctuation very fine and close. Elytra strongly convex, rather pointed posteriorly, cupreous or metallic greenish, like the head and thorax, with closely-approximate and strongly punctured striæ, interstices slightly raised and finely punctured, basal depression absent. Legs entirely fulvous.

Hab. MAURITIUS.—RÉUNION, Plaine des Palmistes.

It is with some doubt that I separate this species from *T. vestita*, to which it is at all events closely allied; but all the specimens obtained by Mons. Alluaud are much larger and more pointed posteriorly, the pubescence is of a more decided fulvous colour and the punctures of the elytra are large and closely placed in striæ, the interstices slightly convex throughout.

At first sight the insect appears to be double the size of *T. vestita* on account of its much greater breadth and length, and the elytral punctuation is distinctly visible in spite of the pubescence.

Trichostola variegata, sp. n.

Below obscure fulvous, above obscure cupreous, the basal three joints of the antennæ and the legs fulvous; head and thorax closely punctured and pubescent; elytra with basal depression, strongly punctate-striate, the interstices slightly convex, with long pubescence the disc cupreous, the sides greenish.

Length, 2 millim.

At once separable from the other species described here by the very distinct elytral depression. Head finely rugosely punctate, cupreous and clothed with grey pubescence, eyes large, labrum

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fulvous; antennæ long and slender, extending beyond the middle of the elytra, fuscous, the lower three joints fulvous, the third joint shorter than the fourth, the terminal six joints very little thickened, elongate. Thorax twice as broad as long, the sides rounded at the middle and deflexed anteriorly, where there is a distinct transverse depression at the sides; surface with similar sculpture to that of the head and equally pubescent, sides greenish, disc cupreous, the posterior margin nearly straight. Scutellum broad, densely pubescent. Elytra clothed with long greyish pubescence, which in well-preserved specimens forms a small and more conspicuous patch at the middle, the punctures large and rather closely placed, the interstices impunctate.

Hab. MAURITIUS, Carepipe.

This species is less convex than the others here described, a feature caused by the sub-basal elytral depression; the thorax has likewise a rather shallow but distinct depression anteriorly, and in some well marked specimens the elytra are coppery at the disc and metallic-green at the sides. I cannot refer this insect to Chapuis's *T. vestita*, which is described, as mentioned before, as flavo-ferruginous. The totally inadequate diagnosis of three lines proves again the utter absurdity of such descriptions as soon as closely allied species become known; such work ought to be ignored altogether.

Trichostola alluaudi, sp. n.

Obscure piceous with æneous gloss, closely pubescent, the basal joints of the antennæ fulvous; thorax extremely minutely and closely punctured; elytra finely and closely punctate-striate, the interstices minutely punctured and closely pubescent, legs dark æneous.

Length, 3 millim.

Of broadly rounded shape, the head not perceptibly punctured, closely covered with grey pubescence, epistome not separated from the face, labrum fulvous, palpi piceous; antennæ extending to within a short distance from the apex of the elytra, piceous, the lower four or five joints fulvous, the third joint longer than the second but shorter than the fourth, the rest elongate and slender. Thorax rather more than twice as broad as long, the sides strongly rounded, surface very finely and closely punctured, closely covered with long grey pubescence. Scutellum subpentagonal, pubescent. Elytra dark æneous, shading gradually to fulvous at the sides and

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shoulders (only visible when viewed sideways), closely and finely punctate-striate, the interstices also very finely punctured and closely covered with long greyish hairs. Legs piceous, femora unarmed, claws bifid.

Hab. MAURITIUS, Carepipe.

Of very convex and broad shape, and at once distinguished by the nearly black legs.

TRICHOSTOLA, Chap.

The species described and referred to in this paper may perhaps be more easily separated by the following table.

Elytra with a distinct sub-basal transverse depression.	
Thorax very coarsely punctured: upper surface æneous	*puberula*, Boh.
Thorax finely punctured.	
Elytral pubescence not arranged in patches: upper surface reddish-cupreous	*aurata*, sp. n.
Elytral pubescence arranged in patches: upper surface variegate	*variegata*, sp. n.
Elytra without distinct sub-basal transverse depression.	
Legs fulvous.	
Elytra finely punctured throughout, the interstices flat; upper surface densely pubescent: length 1¾ mm.	*vestita*, Boh.
Elytra with strongly punctured striæ, the interstices convex and finely punctured: length 2 mm.	*striatipennis*, sp. n.
Legs black: length 3 mm.	*alluaudi*, sp. n.

Ivongius mauritiæ, sp. n.

Fulvous, terminal joints of the antennæ and the legs partly piceous; thorax very sparingly punctured, nearly black; elytra with regular rows of punctures diminishing posteriorly, a spot at the sides, another near the scutellum, and the posterior portion to a greater or smaller extent, blackish-æneous, the rest fulvous; femora unarmed.

Length, 3—4 millim.

Head blackish, vertex with a few punctures, eyes very large with a more or less distinct fulvous mark at their inner margins, clypeus broad, separated from the face by a transverse groove, the sides

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rather acutely raised into sharp edges, surface somewhat strongly punctured, labrum and palpi fulvous; antennæ long and slender the lower six and the base of the following joints fulvous, the second joint nearly as long as the third but much thicker, the others very elongate, slightly thickened. Thorax about one-half broader than long, the sides nearly straight, scarcely narrowed in front, the disc blackish with a slight æneous gloss, more or less marked with fulvous near the margins, with a few fine punctures, irregularly distributed. Scutellum broad, blackish, impunctate. Elytra slightly wider than the thorax, with a distinct transverse depression below the base, strongly punctate anteriorly, the punctures gradually diminishing towards the apex, the interstices smooth and impunctate, the ground-colour fulvous, an oblique spot from the middle of the base towards the scutellum, a smaller spot at the lateral margin below the shoulders, and a large subtriangular patch, occupying nearly the entire posterior portion and sending off a branch anteriorly to the lateral margins, blackish. Underside and legs fulvous, the femora stained with black at the apex, unarmed; prosternum broad and impunctate.

Hab. MAURITIUS, Carepipe.

This insect, on account of the deeply emarginate tibiæ, bifid claws and strongly convex anterior margin of the prothoracic episternum, approaches the group of Typophorinæ but does not entirely conform to any genus which is placed in it, as its femora are all unarmed. In this it agrees with *Liniscus*, Lef., and *Ivongius*, but in the first-named genus the prosternum is constricted at the middle, and *Ivongius* contains species of small size and different shape. Nevertheless the structural characters of the present species are those of the last-named genus, while the shape is that of *Typophorus* or *Syagrus*; the present insect varies considerably in the amount of fulvous or black colour, one or the other predominating.

Nossiœcus lateralis, sp. n.

Oblong, fulvous, the apical joints of the antennæ black; head and thorax impunctate; elytra strongly punctate-striate, the apex nearly impunctate, fulvous, the sides broadly piceous or fuscous; femora unarmed, claws appendiculate.

Length, 3½—4 millim.

Head impunctate, clypeus separated from the face by a distinct transverse groove, broad, the anterior margin semicircularly emar-

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ginate, the surface with a few fine punctures, labrum fulvous, mandibles piceous; antennæ extending beyond the middle of the elytra, fulvous, the apical five joints black, the second and third joints equal, as long as the first, but more slender; apical joints slightly thickened. Thorax twice as broad as long, the lateral margins feebly rounded, the anterior angles continued with the episternum below; surface impunctate or with a few minute punctures. Elytra broader at the base than the thorax, with a very shallow depression below the base, regularly and rather strongly punctate-striate anteriorly, the striæ widely separated, the punctures nearly obsolete near the apex, disc fulvous, the sides with a bluish fuscous or piceous band, which is not well defined at its inner margin and leaves the extreme lateral margin and the epipleuræ of the ground colour. Underside and legs fulvous, the latter unarmed, the posterior four tibiæ emarginate, claws appendiculate.

Hab. MAURITIUS, Carepipe.

On account of the equal length of the second and third joints of the antennæ and the appendiculate claws, I have placed this species in Harold's genus *Nossiœcus*, although in the type the femora are described as toothed. There are moreover only two or three other genera with appendiculate claws placed at present in the group of Typophorinæ, to which the present genus belongs, and none of these genera agrees in structural details with the species before me. It may perhaps require a new genus for its reception, if other forms of similar structure turn up. I may add that the prosternum in this species is broad and flat, and that Harold says nothing about the shape of this part in the description of his genus.

APRIL 20, 1898.

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AUG 2 1898

VIII. *On the Frenulum of the Lepidoptera.* By George Charles Griffiths, F.Z.S., F.E.S.

[Read October 6th, 1897.]

Plate IV.

The existence of an apparatus for connecting the fore- and hindwings of many of the Lepidoptera was first noticed by the Swedish naturalist, De Geer, in the first volume of his "Mémoires pour servir à l'Histoire des Insectes," published in 1752. He there describes "a process curved like a hook, situated on the under surface of the forewing near its base, which holds with its point a long stiff hair springing from the basal portion of the hindwing." This, he says, he has found in the males of all species of nocturnal Lepidoptera in which he has sought it, but not in any of the Diurni. He failed, however, to detect the corresponding appliance in the females, and in summing up his account of the organ candidly owns himself to be ignorant of its use, though he seems to have recognised that it has the effect of making the fore- and hindwings act in unison.

The next mention of the appliance occurs in an essay on the "Tendons and Membranes of the Wings of Butterflies" by Moses Harris, 1767. The author figures and describes the spring or bristle and observes that it pertains only to the males, the females having instead of the spring four small hairs or bristles.

On the 2nd June, 1789, a paper entitled an "Account of a singular conformation in the wings of some species of moths," by Esprit Giorna of Turin, was read before the Linnean Society and published in its Transactions, i, p. 135.

The author was unaware of De Geer's previous reference to the subject, and lays claim to the discovery of the appliance. To this he is, in fact, partially entitled, as he supplements the research of the earlier observers by calling attention to the corresponding apparatus to be found in the females of many species. He gives a list of some

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seventy species examined, and his remarks as to these are for the most part correct and show careful observation, though in one or two instances in which the organ is weakly developed it appears to have been overlooked by him.

Kirby and Spence refer somewhat at length to the appliance but state that it is found "in many male butterflies, hawk-moths and moths." Later observers, however, have determined that, as regards the Diurni, it occurs only in one or two species of the Hesperiidæ, which in some other respects partake of the characters of the Heterocera. Blanchard, indeed, has given the name Achalinoptera to the butterflies and Chalinoptera to the moths on account of the absence or presence of the apparatus, but this, as will presently be seen, is not of sufficiently general occurrence to be made use of as a discriminating character of such importance. Kirby and Spence refer rather unfortunately to the organ of the male as consisting of one *or more* bristles but add that the females often have the bristles, but never the hook.

Burmeister in his "Handbuch der Entomologie," and Boisduval in the "Spécies général des Lépidoptères," 1836, both refer at some length to the frenulum, as also does Prof. Westwood in his "Introduction to the Modern Classification of Insects," 1838.

Dr. Chenu in his "Encyclopédie d'Histoire Naturelle" (Vol: Papillons Nocturnes, by E. Desmarest) mentions the organ, but assigns as its object the maintenance of the wings in a horizontal or an inclined position during *repose*.

It will be evident from the above that the accounts of the frenulum as given by various authors differ both as to its development and its purpose.

In commencing an examination of the subject several years ago this was brought strongly under the notice of the writer at the outset, and it seemed that much might still be learned from a study of the appliance in a large number of examples extending over the various groups and genera of the Heterocera. Accordingly an examination, either microscopic or by means of a platyscopic lens, has been made of the majority of our British moths, including the so-called Micro-lepidoptera, and of several hundred species of exotic Heterocera. The results of this investigation are here recorded.

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Since this examination has been in progress Prof. Comstock in his essay, "Evolution and Taxonomy," published in 1893, and subsequently in his "Manual for the Study of Insects," 1895, has formulated a classification of the Lepidoptera principally based on wing-characters. He proposes a division of the Order into two Suborders, Frenatæ and Jugatæ, the former of which embraces all those species which either possess this structure or appear to be descended from groups formerly possessing it, whilst the Jugatæ have the wings united by a lobe or jugum. The latter Suborder consists only of the Hepialidæ and Micropterygidæ, which are certainly some of the most primitive of the Lepidoptera, and in other respects, as well as in the possession of the jugum, are clearly related to the Trichoptera.

With the merits of this classification we cannot deal, but will simply observe that the frenulum is scarcely so persistent or general in its occurrence as to give its name to a broad division of the Lepidoptera.

Mons. E. L. Ragonot (Essai sur la Classification des Pyralites, 1891), Sir George F. Hampson (Fauna of British India—Moths, 1892–96), Mr. E. Meyrick (Handbook of British Lepidoptera, 1895), and Dr. A. S. Packard (Monograph of the Bombycine Moths of America North of Mexico, 1895) have all considered the frenulum with great care, employing it with other characters in discrimination of genera, whilst they do not attribute to it the supreme importance claimed by Comstock.

Speaking generally, and with certain exceptions to be mentioned later, we find in those species which possess the frenulum that the males have a strong single bristle, springing from the costal nervure of the hindwing, and passing through a loop, or sometimes into a pocket, situated on the costal nervure of the forewing; that the females usually possess two or more slender and weak bristles upon the hindwings in place of the single bristle of the male insect, and that these bristles, instead of passing into a loop, are simply thrust into, and entangled among, a group of large raised scales or hairs situated between the costal and median nervures of the forewings.

And here at the outset we meet with a difficulty arising from the confusion of names applied by different authors to the various parts of this appliance. Whilst De Geer speaks of the bristle under the name of *poil* and

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denominates the loop *crochet*, Giorna calls the former *ressort*, *appui* or *fulcrum*, and the latter *anneau*. Kirby and Spence name the bristle *tendo* and the loop *hamus*; Boisduval appropriates to the bristle the names of *crin* or *frein* and to the loop that of *coulisse*; some authors following him so far as the bristle is concerned give it the Latinised designation of *frenulum*, whilst Burmeister speaks of it as *crin* or *subula*, at the same time applying to the loop the name of *frenulum*.

In view of the confusion arising from these various names it seems convenient in this paper to retain the name *frenulum* for the organ as a whole; to speak of the strong single bristle of the male insect as the *spina*, referring to the group of smaller bristles of the female under the diminutive plural *spinulæ*; to speak of the loop which holds the bristle of the male as a *retinaculum*, the term now in general use by Hampson and other recent writers, and to refer to the bunch of scales in the female as a *fasciculus*.

Having thus cleared the ground, we may now consider the varied development of this organ as observed in the several divisions of the Lepidoptera.

The only Rhopalocerous insect known to the writer as having the frenulum completely and functionally developed, is the very curious and interesting Hesperiid from Queensland, *Euschemon rafflesiæ*.

In the male (Fig. 14) the spina is strong and of considerable length and works through a fully developed retinaculum, bare or almost bare of scales. In the female the spinulæ are perceptible only with difficulty, and are short and weak bristles, five in number, probably of little or no value to the insect. In the "Classification of the Hesperiidæ" by Lieut. E. Y. Watson (P.Z.S. 1893, p. 3) this insect is omitted from the list and is considered to be a moth, principally on the ground that it possesses the frenulum; but at that time the larval and pupal stages were unknown. The writer is glad to be able to announce that these have now been discovered by a correspondent in Queensland, and as in both stages the insect is clearly allied to the Hesperiidæ, its claim to be placed among them will probably be fully sustained. Two or three other exotic species of Hesperiidæ possess small bunches of hair-like scales upon the hindwings which are evidently rudimentary spinæ, but these are unaccompanied by even

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a trace of the retinaculum and are quite useless: they are, however, very interesting as showing the near relationship of these insects to the Heterocerous Lepidoptera.

The Sphingidæ exhibit the highest development of the frenulum, the spina of the male insect attaining its maximum of size and strength and the retinaculum being powerful and capable of holding with a firm grip. In the female insect too the spinulæ are strong, and their extremities converge to a strong fine point, thus forming a claw or hook, which catches the fasciculus of the fore-wing with considerable effect. These characters hold good as regards the majority of the species of this family, but some members of the subfamily Smerinthinæ form a noteworthy exception. Of one of these, *Smerinthus populi*, Giorna states in the paper referred to, that it is without the appliance. Such, however, can hardly be said to be the case; the male insect possesses, in the position occupied by the spina in other species, a process standing out from the margin of the wing, rounded in outline and in some few examples terminated by a minute point (Fig. 4). This process corresponds to the root or prominence which in other species carries the spina.

The female has a much more largely developed apparatus; not only does she possess the root-process, but also a perfectly formed group of spinulæ (Fig. 5), which, however, are too small to be of any practical use in connecting the wings; so that the organ in both sexes may be considered abortive.

The retinaculum of the male is absent, as we might expect, and its place is simply indicated by a most inconspicuous group of scales. It will be evident on consideration that the peculiar rest-position always assumed by *S. populi* would be quite impossible in a species with fully developed spina and retinaculum, inasmuch as the humeral angle of the hindwing always projects before the costal margin of the forewing, and it would be necessary for the moth to withdraw the bristle from its loop every time that it composed its wings for rest.

A similar rudimentary development of the part also occurs in greater or less degree in several other allied species, notably in the fine Australian species, *Cœquosa triangularis*, which has the spina very short and probably quite useless. Some other Smerinthinæ, however, such

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as the genus *Mimas* of Hübner, which includes *M. tiliæ* and *M. quercus*, have the appliance fairly well developed. So also the very fine and remarkable South African moth, *Lophostethus dumolini*, which is usually referred to the Smerinthinæ, has the organ well and strongly developed in both sexes.

The flight of many Smerinthinæ is so different from that of the typical Sphingidæ, and their habits are so much more sluggish, that it is interesting and instructive to find a diversity in the perfection of this apparatus.

Further, as we shall presently see, the spina and retinaculum are absent in the Saturnias and Attaci, thus affording another character which strongly supports Prof. Poulton's contention (Trans. Ent. Soc. Lond., 1888, p. 568) that the Smerinthi are closely connected with the Attaci in their natural affinities.

In the Zygænidæ the retinaculum, instead of being hook-like or ring-like, resembles a long pocket upon the costal nervure into which the spina fits somewhat closely, the point being sometimes just visible at the extremity, but often quite concealed (Fig. 10). The genus *Himantopterus* belonging to this group is however without the frenulum (Hampson—Moths of India, i, p. 288).

The Cossidæ have the frenulum present but it is absent in the Arbelidæ.

The Lithosiidæ are possessed of the frenulum but in certain genera, *Padenia*, *Garudinia* and *Pseudoblabes* the costa of the forewing has a strong fold, holding that of the hindwing; this fold is more largely developed in the male than in the female (Hampson, *l. c.* ii, pp. 97, 98).

Both the Agaristidæ and the Arctiidæ have the process strongly and fully developed, the retinaculum in many of the latter being of very unusual length (Fig. 8).

The Lymantriidæ also possess the frenulum, with the exception of the genus *Ratarda* in which it is absent (Hampson, *l. c.* i, p. 493).

In the Callidulidæ one genus, *Cleosiris*, is quite without the frenulum, whilst in another genus, *Herimba*, the spina is long, the retinaculum of the male arising from the subcostal nervure of the forewing. In the other genera of this family, *Callidula* and *Pterodecta*, the frenulum is present but minute; the retinaculum arises from below the median nervure (Hampson, *l. c.* i, p. 322).

In the Bombycidæ, Saturniidæ and Lasiocampidæ a

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large number of species have been examined, and in all of these the frenulum is found to be entirely wanting. The rudiment of the spina may indeed be detected, as is observed by Burmeister. It is enclosed in the membrane of the hindwing, but is perfectly useless, and does not even extend to the edge of the wing. When we consider the shape of the wings in this group we perceive that the frenulum is not required, as the anterior angle of the hindwing is carried forward in a kind of shoulder almost or quite to the costal nervure of the forewing, and as this nervure in many species bends back over the surface of the wing, it seems probable that during flight the prominent shoulder of the hindwing locks beneath it. The common silk-worm moth, *Bombyx mori*, however, which has this configuration of wing, still possesses a very small rudimentary spina, as do also the two remarkable North-American moths, *Cicinnus melsheimerii* and *Lacosoma chiridota* referred to by Comstock (Study of Insects, p. 357).

The Uraniidæ, so difficult to assign to a satisfactory position in classification, exhibit a similar development of the humeral portion of the hindwings, and both spina and retinaculum are absent so far as the genus *Urania* is concerned. *Nyctalemon* has in some few instances a very imperfect rudiment, but *Sematura* possesses the appliance, although so feebly developed as to be of very little use. *Coronis*, on the other hand, in the thirteen species which have come under the writer's observation, has a frenulum, the bristles of which, although rather slender in both sexes, are in all cases sufficiently strong to be effective.

In the Epicopiidæ the spina is quite rudimentary. The late Mr. G. R. Gray in his classification of the difficult group Castniidæ (Trans. Ent. Soc. Lond., ii) based his division in part upon the development of this organ, assigning to some species the possession of three, and to others of four, "wing-guides." Unfortunately the specimens, upon which these characters were founded, must have been females, as examination shows that this singular group is in accord with nearly all others in which the frenulum is found, in having the spina single in the male and double at least in the female.

The Notodontidæ possess the frenulum, but in many species in little more than a rudimentary degree, that of *Stauropus fagi* in particular being very small.

Amongst the Drepanulidæ the humeral angle of the

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hindwings is largely developed, but all our British Hook-tips have a weak and slender frenulum in the male, and a small bunch of spinulæ in the female, which is probably of little or no functional value. The organ is absent altogether, according to Hampson and Comstock, in the genera *Phalacra* and *Oreta*.

Nearly all the species of the great family Noctuidæ possess the frenulum in normal development, though slight variations in the strength of the bristles occur in certain genera. Of the genus *Stictoptera*, however, which has not come under the writer's observation, Hampson remarks:—"Frenulum of male very strong; single in female." This single spina of the female is very interesting, as being at variance with all the nearly related genera.

In the Geometridæ the frenulum is found in the great majority of the genera, but, as may be expected from the frail and slender structure of their wings and bodies, it is of weaker development than in the stronger-bodied Noctuidæ. In the genera *Pseudoterpna*, *Geometra* and *Phorodesma*, however, the humeral angle of whose hindwings is much extended, we find in the male the spina very weak, and in the female the spinulæ either nearly rudimentary or altogether wanting, whilst in *Iodis* the frenulum is entirely absent in both sexes. In one section of *Synegia*, as defined by Hampson (Moths of India, iii, p. 167) the retinaculum is a tuft of hair, in a second it forms a large spatulate plate, whilst in a third it is described as bar-shaped. Other genera according to the same author lack the organ, namely, *Genusia*, *Hypulia*, part of *Naxa*, *Eucrostes*, *Paramaxates* and *Thalera*.

Writing of the Sesiidæ, Prof. Comstock (Study of Insects, p. 260) says:—"Another remarkable feature of all the forms that we have studied is that in the female the bristles composing the frenulum are consolidated as in the male." Amongst our British Sesias this holds good in respect of *Sesia ichneumoniformis* and *S. cynipiformis*; but *S. myopæformis* ♀ and *S. tipuliformis* ♀ (Fig. 15) have the spina single for about one-third of its length and bifid at the tip. As *S. tipuliformis* occurs in North America, this peculiarity has apparently been overlooked by Comstock; this is not surprising, as the spina under microscopic examination appears at first sight to be single, and its divided nature is only revealed when subjected

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to slight pressure. The spina of the female rests under a catch composed of scales proceeding from the costal nervure of the forewing, which bends over very strongly. It is to this catch that Prof. Comstock probably refers when he goes on to remark:—"The females also possess a frenulum-hook; but this is not so highly specialised as that of the male." It may be mentioned that *Sesia omphale*, ♀, a native of Florida, has a weak double spina, and that *Trochilium crabroniforme*, ♀, has a frenulum composed of five spinulæ locking into scales upon the median nervure, as in the normal development of this appliance.

The Tortricina and the majority of the Pyralidina have the frenulum of the usual character, but it is in some of the members of the latter group that the most singular variations of this organ exist. Hitherto we have found that the spina of the male insect works through a retinaculum arising from the costal nervure of the forewing: but in several species of our British Pyralides the male spina locks into a fasciculus of strong scales on the median nervure of the wing, in fact in the manner generally characteristic of the organ in the female. Amongst these species are *Agrotera nemoralis*, *Endotricha flammealis*, *Diasemia literalis*, *Stenia punctalis*, *Botys flavalis*, *B. fuscalis*, *B. verticalis* and *B. asinalis*. In each of these species the female insect has two spinulæ, but in *Cataclysta lemnalis* (Fig. 16) which has the male frenulum as above described, the female has a single spina exactly similar to that of the male. In the subfamily Phycitinæ according to Ragonot (Mon. Phyc. 1894) and Hampson (Moths of India, iv, p. 64) the spina of the frenulum is simple in the female, as in the male. A striking peculiarity of the Chrysauginæ is referred to by Ragonot (Essai sur la Classn. des Pyralites, 1891) and Hampson (P.Z.S. 1897, p. 633). In many species the spina of the male is described as being much thickened, flattened and contorted, and in some instances accompanied by a strong lower fork; this very singular development does not appear to have its parallel in any other group.

Certain species of the genus *Crocidolomia* referred to by Hampson (Moths of India, iv, p. 371) have a thick tuft of hair springing from the subcostal nervure, whilst from a fringe below the median nervure arise four strong curved spines playing on the subcostal tuft. At first sight these

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processes appear to be ancillary to the frenulum, but a careful examination by the writer of several specimens from Queensland, leads to the conclusion that this is not the case. No binding of the wings can be due to these spines, as both they and the tuft of hair belong to the forewing only, whilst the supposition that they hold down the point of the spina after passing through the retinaculum is negatived by the fact that they are at too great a distance from the base of the wing to come in contact with it.

The great division of the Tineina, which has been observed by several recent writers to be of a very heterogeneous character, proves to be so also in respect to the frenulum. Whilst the great majority of the species possess it and in numerous instances the spina is of a greater size in proportion to that of the insect than in many of the larger moths, yet in one or two groups it is found to be wanting. In the Nepticulidæ, particularly, this is the case; also in *Micropteryx*, which in most of its species has a well-developed jugum, this is only rudimentary however in *M. calthella* and *M. seppella*. Several species of this group have a few strong hairs on the costal margin of the hindwing, which, as Dr. Chapman points out, may be a commencing frenulum.

Turning next to the structure of the organ under consideration we find on microscopic examination that the spina of the male insect, simple and homogeneous as it appears at first sight, is really composite in its character. Viewed under a high power its apparently polished and smooth surface is seen to be deeply furrowed with fine longitudinal lines, and the significance of this is made clear when, on making a transverse section, we find that the spina is really an agglutination of tapering hollow tubes or hairs, and is in fact evolved from the less perfect organ of the females by fusion of the bunch of spinulæ into one strong bristle. Being thus made up of hollow tubes the spina possesses great elasticity as well as strength.

The spinulæ of the female when microscopically examined are found to be simple hollow tubes, and these, with the few exceptions just cited, vary in number from two in some species, to upwards of twenty in others. They spring like the spina of the male from a raised socket formed by an extension of the costal nervure of the hindwing.

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The retinaculum in its normal form is a process springing out of the substance of the costal nervure of the forewings, and curling over at the end into a small loop or ring; this process is usually thickly covered with scales. In those cases before-mentioned in which its form is that of a pocket receiving the point of the spina, rather than a loop, this pocket is formed in the same way from the substance of the nervure, and in most cases it also is clothed with scales.

The fasciculi or bunches of scales which receive and hold the spinulæ of the female are larger and longer than the other scales of the wing, but beyond this they possess no distinguishing character. Whilst speaking of these we must not forget to notice certain long bunches of hair-like scales which are often found associated with this organ; these proceed from the thorax of the insect and lie across the spina or spinulæ, thus probably helping to keep them in position.

We have next to consider the two different purposes assigned to this appliance by various observers, namely, the holding of the wings in position during repose, or, as an alternative, the locking together of the fore- and hind-wings as an aid in flight. With a view to ascertain the correctness or otherwise of the first supposition, the spinæ of several living male specimens of moths were amputated, such species being selected as assume a well-marked and striking position during repose—*Pygæra bucephala* and *Sphinx ligustri* being amongst those experimented upon. In every case the original rest position was again assumed by the insect after the operation.

The behaviour of these insects, having one or both of the spinæ removed, was then observed during flight, the movement of their wings being watched as they flew up and down before the glass of a closed window. In all cases in which one spina only was amputated, a difference in the blur of the rapidly moving wings was noticed, the wings on the side experimented upon being observed to move more independently of each other. These experiments being conducted within-doors in order to prevent the escape of the insect, the conditions were somewhat unnatural, and no very clear idea could be arrived at respecting the actual loss of power of flight resulting from the want of one or both spinæ. It is probable that the effect of the wind upon a moth so situated would be very

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great, for the wings which before presented one broad strong surface to the breeze, would after the amputation of the spina lose much power by the escape of the air between them, and would probably be bent or displaced if the wind were at all boisterous.

Another point having a bearing upon the question of the use of this apparatus was noticed in a female specimen of *Deilephila euphorbiæ*, and might no doubt be observed in many other species. The insect resting on a flat surface with its wings outspread held the anterior margin of the hindwings in such a position as to be just in contact with the costal nervure of the forewings, but on being disturbed it prepared for flight by bringing forward the front pair slightly, and strongly depressing their points. This clearly forces the spinulæ into close contact with the fasciculus of long scales destined to receive and hold them, and thus locks the wings firmly together. This proceeding was gone through by the insect again and again on being disturbed, and is evidently its first preparation for flight.

In the examination of living specimens the writer was at first somewhat doubtful whether the male insect, if by accident it should withdraw its spina entirely from the retinaculum, would be able to replace it at will, but this point was cleared up by the chance discovery of a male specimen of *Ennomos angularia* lying upon its back in a pool of water. On examination the spina of the left wing was found to be withdrawn from its retinaculum. It was placed in a position in which it could dry its wings and from time to time examined to ascertain whether the spina had been replaced. Before the next morning the moth had once more inserted it in the retinaculum.

It seems clear from the foregoing experiments that the purpose of the frenulum is to hold the wings together during flight, and this conclusion is accepted by most recent writers. The organ is therefore analogous in its purpose to the less perfect jugum of the Trichoptera and *Micropteryx*, to the wing-hooks of the Hymenoptera and to the locking apparatus of *Belostoma*.

PLATE IV.

[*The explanation faces the* PLATE.]

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IX. *The Larva of* Pelophila. By the Rev. William Frederick Johnson, M.A., F.E.S., and George H. Carpenter, B.Sc., F.E.S.

[Read February 2nd, 1898.]

The ground-beetle *Pelophila borealis* (Payk.) is among the most interesting of our native insects. Spread over the northern parts of Siberia, Russia and Scandinavia, it seems to be entirely absent from Central Europe as well as from the mainland of Great Britain. It occurs however in the Orkneys, while in Ireland it is widely distributed in Ulster, Connaught and Munster, down to the south-western corner of the island. This beetle is, perhaps, the most striking instance of a typically Arctic species ranging in Ireland far to the south, where it finds itself in company with the characteristically southern animals and plants of the Lusitanian fauna and flora. *Pelophila borealis* and one other species of the genus inhabit Europe, while several other species have been described from the northern parts of Asia and America. The genus, therefore, has a complete circumpolar range.

Systematic writers on the Coleoptera class *Pelophila* with *Leistus*, *Nebria*, and *Eurynebria* in the tribe Nebriina,* which is distinguished from the nearly allied Elaphrina (comprising *Blethisa* and *Elaphrus*) by the coxal cavities of the front legs being open behind. Fowler remarks however† that *Pelophila* appears to form somewhat of a connecting link between the two tribes; although its mouth-parts resemble those of *Nebria*, the general form of the beetle is like that of *Blethisa*. It will be seen that, in the larval stage, *Pelophila* in several most important points of structure differs from *Nebria* and *Leistus* and agrees with *Elaphrus*. On larval characters it will now be impossible to discriminate sharply between the two sections.

* Fowler and Sharp, "Catalogue of British Coleoptera," London, 1893. Ganglbauer, "Die Käfer von Mitteleuropa," i, Wien, 1892.

† "The Coleoptera of the British Islands," i, London, 1887.

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LIFE-HISTORY AND HABITS.

So far as we know the early stages of *Pelophila* have not hitherto been described. It seems worth while, therefore, to place on record a few facts concerning the life-history of *P. borealis* which one of us has been able to observe during several years' collecting in the neighbourhood of Armagh, together with a detailed account of the external structure of the full-grown larva.

The female beetle lays her eggs in the ground. They are hatched in the course of three or four days, and the grubs, when they first emerge, are white and soft-skinned. At the age of four days, the larva has attained a length of 4 mm. and is covered with dark chitinous armour. The insect at this stage (Fig. 1) scarcely differs in structure from the full-grown larva, except for the very marked constriction at the seventh abdominal segment, and the simple form of the cerci (Fig. 2). At this early stage, these are fixed processes of the ninth abdominal segment, not mobile appendages as they become in the full-grown larva (Fig. 10). There are, moreover, but few nodular tubercles and setæ, as compared with the complex arrangement developed at a later stage.

By feeding the grubs on raw beef which they devoured greedily, it was possible to rear them until they had attained their full growth. The time taken in completing the larval development was about a fortnight. Full-grown larvæ were subsequently discovered in well-known haunts of the beetle, their identity being placed beyond doubt by their correspondence with the grubs which had been reared from the eggs. Unfortunately none of the larvæ pupated, as all those reared to their full size met with accidents. They seemed to devour their cast skins, as none of these were found, and one was observed devouring what appeared to be its cast skin.

In their native haunts the habits of the larva are much the same as those of the perfect insect. They live on the borders of lakes and banks of rivers preferring a firm clay bank with plenty of loose stones lying on it. They are always found at a short distance from the water where the ground is moist, a condition which seems indispensable to their well-being. The larvæ are very active and run about quickly when disturbed. They hide under stones and they either wait for their prey there, or else pursue

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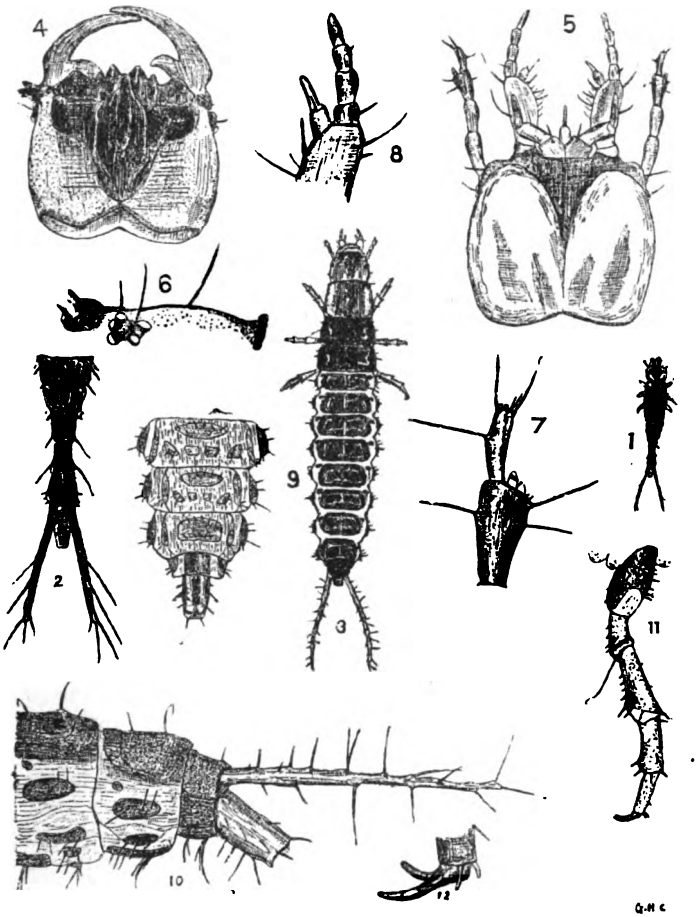

DESCRIPTION OF FIGURES.

1. Young larva (four days old) of *Pelophila borealis* (Payk.) 2. Hinder end of young larva, showing cerci. 3. Full-grown larva of *Pelophila borealis*. 4. Head from above, with mandibles. 5. Head from beneath, with antennæ, maxillæ, and labium. 6. Ocelli, from side. 7. Terminal segments of antenna. 8. End of maxilla. 9. Terminal abdominal segments, from beneath. 10. Terminal abdominal segments, anal tube, and cercus from side. 11. Leg of the first pair. 12. End of tarsus and claws.

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it at night. During the earlier stages of its existence the larva must hide very carefully as it has not been found in its haunts until full-grown or nearly so. When full-grown the larva is easily observed, just like the imago by turning over stones in the place it frequents. The larva, when young, is more restless than when full-grown; it runs about trying things with its mandibles evidently in search of food. When full-grown it becomes less restless and though if disturbed it makes off with great rapidity rushing into any hiding place that offers, yet otherwise it sits quietly in the one spot.

The perfect insect is most plentiful in the months of May and June, but it has occurred as early as April 4th and as late as October 4th. The larvæ are to be found in August and September. From these dates it would seem probable that the beetle hibernates either in the pupal or in the imaginal state. That the latter occurs, in some cases, was shown by experiment. Several specimens were placed in a flower pot and covered with a glass shade; they vanished during the winter but reappeared in the spring, quite well, though no food had been supplied to them for five months. They had evidently spent the intervening time in a state of torpor. Their place of concealment when under natural conditions has not been detected. At Lough Neagh, and also at Lowry's Lough near Armagh, the locality they haunt in the summer is in winter covered with water, so that they must retire to a position above the reach of the floods and here burrow into the ground, for they were not found in moss taken from the bank at Lowry's Lough where they were most likely to have taken refuge. We have no facts bearing on the duration of the beetle's life, except that specimens captured during the first week in August bred, and were still alive and vigorous, at the end of the month when they were removed to avoid the danger of their attacking the young larvæ.

Structure of Full-grown Larva.

The full-grown grub of *Pelophila borealis* measures 14—15 mm. in length. It is of elongate form, attaining its greatest breadth (2·5 mm.) at the third segment of the abdomen, whence it tapers gently towards the head and more decidedly towards the tail-end. (Fig. 3.)

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Head. The head is subquadrate, flat above with a deep median groove, and a deep lateral depression behind each antenna; hardly produced in front, the margin of the clypeus bearing four teeth of which the centrals are more prominent than the laterals; slightly convex at sides and beneath; rather strongly emarginate behind, but not constricted into a neck. Above and in front, the surface of the head is black and rugose, the epicranial and lower lobes are smooth and yellow, each lobe beneath being marked with two longitudinal dark streaks (Figs. 4, 5). There are six ocelli on each side, situated just behind the antenna, arranged in two transverse rows of three each; the forward row is the longer, and its two terminal ocelli are the largest of the six, the dorsal ocellus of the hinder row being only slightly smaller (Fig. 6).

Antennæ. These are rather shorter than the head; the first segment is the longest, the second and third each three-quarters as long as the first, the fourth three-quarters as long as the third (Fig. 5). The third segment is enlarged distally and carries three papillæ, of which the longest shows rudimentary segmentation; at the end of the fourth segment are two papillæ (Fig. 7).

Mandibles. As long as the antennæ, rather slender, evenly curved, bearing a stout tooth near the base (Fig. 4).

Maxillæ. The stipes is elongate nearly half as long as the head; the lacinia is represented by a minute setigerous papilla; the galea is two-segmented, with the distal segment slightly longer than the proximal; the palpigerous stipes is short and cylindrical; the palp is three-segmented with the first segment slightly longer than the third, and the third, which is conical, slightly longer than the second (Fig. 8).

Labium. The palpigerous stipites are short, cylindrical and divergent; the palp is two-segmented, the proximal segment stout and cylindrical and rather longer than the distal which is slender and conical; the ligula is elongate, rounded at the tip, and bearing two long setæ inserted close together, and directed straight forwards parallel to one another (Fig. 5).

Thorax. The pronotum is trapezoidal, its length equal to its breadth in front, which is as broad as the head; evidently widened behind; there are two lateral depres-

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sions; the colour is deep black in the centre, shading off to dark brown at the sides.

The mesonotum and metanotum are each three-quarters as long as the pronotum, deep black, each with two lateral sinuate depressions.

A central longitudinal suture is apparent on the dorsal aspect of all the thoracic and abdominal segments.

The prothorax is chitinous beneath from the front margin to the insertion of the legs. In the meso- and metathorax, the sternite is reduced to a small sub-triangular median plate.

Legs. The legs are of moderate length, the two hinder pairs as long as the breadth of the metathorax, the front pair rather shorter. The coxa is twice as long as broad, its outer surface bearing a row of strong setæ. The trochanter is half as long as the coxa, thickened distally, bearing on its inner surface a double row of spines and a long tactile seta. The femur is slightly longer than the coxa, bearing spines along its inner margin (in double row), and around its thickened distal extremity. The tibia is two-thirds as long as the femur, slightly thickened distally, bearing a single external basal spine and a prominent subapical series. The tarsus is slightly shorter than the tibia, cylindrical, bearing a fine spine near the base, and two stout ones at apex; the two claws are equal in length, slightly curved and ending in a blunt point (Figs. 11, 12).

Abdomen. The terga of segments 1—8 are similar in form, transverse with anterior and posterior ridges and lateral sinuate depressions; the tergum of the ninth segment is much narrower and shorter than the preceding. The pleuræ of segments 1—8 are oblong-oval, that of segment 9 oblong. There are seven ventral plates on each of the segments 1—7: a transverse hexagonal anterior plate, four small plates arranged transversely posterior thereto, the two centrals being subquadrate and the two laterals subtriangular, and a pair of lateral oval plates arranged longitudinally. The eighth segment has a single quadrate central plate, and the pair of lateral oval plates as the preceding segments. The ninth segment has only a single ventral plate (Fig. 9). The anal cylinder is about twice as long as its diameter or as the length of the ninth segment. The cerci are long and mobile, provided with numerous nodulose tubercles bear-

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ing long setæ, the arrangement of which does not exactly correspond in the two cerci of the same individual (Fig. 10).

Comparative Morphology of the Larva.

As mentioned above, the genus *Pelophila* is classed, by its imaginal characters, with *Leistus* and *Nebria*. In the larval stage it resembles those genera in the possession of long, mobile cerci, as well as in the general structure of the antennæ and mouth-parts. But it differs widely from them in its broad quadrate head and short legs with equal tarsal claws. The larva of *Pelophila* indeed shows relationships with various carabidous larvæ of widely separated genera. The form of the head, without the constricted neck so characteristic of the Nebriina, recalls that of *Elaphrus*, and still more perhaps that observed in certain Harpaline genera, such as *Broscus*, *Chlænius* and *Pterostichus*.* The larva of *Pelophila* agrees with these latter in the insertion of the antennæ over the base of the mandibles. The head-appendages agree generally with those of the Nebriine larvæ, as well as with those of *Elaphrus;* in the proportional lengths of the segments of the maxillary galea *Pelophila* is intermediate between these two groups. The long paired setæ of the labial ligula again recall the larval characters of *Broscus* and *Chlænius*. A character in which our larva is most clearly separated from the Nebriina is the comparative shortness of the legs, which by the arrangement of the spines and the equality of the two tarsal claws resemble those of *Elaphrus* and the Harpalinæ. It is remarkable that *Amara* seems the only other carabidous genus in which the larval tarsi are shorter than the tibiæ. The abdominal cerci are the most unequivocal nebriine structures to be found in our larva. It is of some interest to note that while the cerci of the full-grown *Pelophila* grub closely resemble those of *Nebria*, in the young larva they are simpler, as in the full-grown grub of *Leistus*. As mentioned above, these cerci are mobile in the full-grown larva, but not in the young. In the majority of carabidous genera these appendages appear to remain fixed throughout larval life.

* Schiødte, "De Metamorphosi Eleutheratorum," Pars. III. (Naturh. Tidsskr. iv. 1867.)

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Relationship of Pelophila to other Carabidæ.

The combination in the grub of *Pelophila* of structures characteristic of the Notiophilina, Nebriina and Elaphrina suggests that we have to do with an archaic type near to the common ancestors of these tribes, a view supported by the restricted northern range of *Pelophila* and the small number of its species. Also the similarity in several points between the grub of *Pelophila* and those of harpaline beetles gives evidence that it must be regarded as a generalised member of the Carabidæ since it shows affinities with such dissimilar types. There can be little doubt that the possession of long abdominal cerci is an archaic character, when we consider that such appendages are found in primitive insects such as the Thysanura, Ephemerids and Perlids. The fact that in the young larva of *Pelophila* the cerci are comparatively short, and fixed, might indeed be thought inconsistent with such a view. But it is possible to regard the persistence of this condition of the cerci in the great majority of carabidous larvæ as an instance of arrested development. The long legs of the larvæ of *Loricera*, *Notiophilus*, *Nebria* and *Leistus*, the head constricted behind into a narrow neck, and (in *Leistus* and *Notiophilus*) drawn out in front into long spinose processes, appear on the other hand to be specialised characters, adapted to ready and rapid motion. From such a larva as that of *Pelophila*, then, can be derived, on the one hand, those of the Nebriina and Notiophilina, in which the head and legs have become highly modified while the primitive cerci have been retained; on the other hand, those of *Elaphrus* and the majority of the Harpalinæ, in which the primitive quadrate head and short legs have been retained while the long cerci have become greatly reduced.

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X. *Some Remarks on* Heterogyna penella. By Thomas Algernon Chapman, M.D., F.E.S.

[Read March 16th, 1898.]

Heterogyna penella is a moth with an apterous female, and a male of the same flimsy black texture as many Psychids. But to these it does not appear to be at all related, nor to any other group with apterous females. Whether the very similar aspect of the males of *H. penella* and some Psychids is purely accidental, or whether habits similar in some respects are in any way facilitated by their very similar facies, that is, whether this black, gauzy texture is of advantage to both under like habits, is a question in elucidation of which I have not been able to range any facts.

Except that it is not of a whitish colour, the female of *H. penella* is more maggot-like than that of most Psychids. One of its most obvious differences is that it is coloured in almost exactly the same way as the larva, with a characteristic pattern in black and yellow, and it even happens, that a larva pale from a predominance of yellow, or dark from the dark markings being more pronounced produces a moth varying in precisely the same manner. The female moth has even been described as being the same as the larva, and superficially it resembles it very exactly. Besides the essential differences between a larva and an imago, it differs in possessing no appendages whatever; not only has it no wings and no legs, but it has no tubercles, scales, or hairs of any sort, the skin being smooth and shining, with some wrinkles due to muscular attachments and traces of circular marks in the position of the larval prolegs. The male moth even has some yellow markings on the abdomen that are in the same positions as those of the larva, these are actual body markings, the hairs being all black; though it is apparently clothed sparsely with hairs only, a considerable proportion of these, especially on the wings, are really scales, being somewhat flattened and striated.

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The most specialised peculiarity of this moth (*H. penella* ♀) is that it emerges from its cocoon and pupa case, remains outside until the male is attracted and for a bare ten minutes after, and then re-enters its pupa case. This drops back into the cocoon, and the appearance is the same as if the moth had never emerged. The mechanism by which this manœuvre is accomplished by a maggot without appendages is very interesting.

Until last year (1897) I had never met with the species in sufficient numbers to make any observations of value; I had found the female pupa case a very puzzling structure, and not having seen the male pupa, could form no idea of its relationships. Last spring, however, I met with it freely at Digne and have been able to observe it very fully.

Whilst *Heterogyna penella* inhabits a large part of Southern Europe, it would appear that the Basses Alpes are its headquarters, and in some districts of this department it has even been described as destructive; it is not, therefore, surprising that Digne affords it in plenty, at an elevation of 2,000 to 3,000 feet. I do not think it is at all common towards the Mediterranean coast, but it descends to lower levels and a warmer climate than Digne, whilst I have also taken it at Lauteret at 8,000 feet, where intense cold obtains in winter, and the summer is comparatively short. Such a range of climate, with so narrow a geographical range is difficult to understand. As I am not aware that it is anywhere double brooded, I conclude that, in its warmer habitats, it goes into hibernation before midsummer.

The larva is full-fed at Digne about April 20th to 30th, at Lauteret nearer the end of June. The males are full-fed quite ten days before the females.

To spin their cocoons the males seek a dead twig of the food plant (chiefly broom at Digne) or a dry stem of grass, against one side of which, usually in a prominent and conspicuous position, they spin a spindle-shaped cocoon of silk, at first white, then turning golden-yellow, of a somewhat open texture, so that the contained larva or pupa is easily seen. A large proportion of these at once produce parasitic dipterous larvæ; only twice were any other parasites produced, these were chalcids.

The diptera emerge in confinement in six or eight weeks, certainly too early to infest the next brood of

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penella, so doubtless they have alternative hosts, as with other of these dipterous parasites. I forwarded a small supply of them to Mr. Bignell, who attempted to ascertain their name, with the following results from different authorities:—*Demoticus plebeius*; a *Blepharidea* near *B. vulgaris*; a species of *Ceromasia*. For aught I know these are synonyms.

The female does not usually place her similar but much larger cocoon so conspicuously, and I think even makes some attempt to hide it, near the ground, under a leaf, &c., nor are so many to be seen, though the larvæ are equally abundant. These also produce the dipterous parasites, but I think much less abundantly than the males.

The larva in its short squat form and sluggish habits reminds one of those of the Zygænas, and like them they have minute stellate skin points. They retain, however, simple one-bristled tubercles up to the adult stage, and so have none of that angularity and upholstered-cushion appearance so characteristic of Zygænas.

The prolegs also, though of macro-lepidopterous type, are much less fully evolved than in the Zygænas. The circle of crochets is, indeed, quite incomplete on the outer aspect, but the hooks extend round the front and back of the pad suggesting rather a complete circle damaged on one side than the fully evolved foot with single inner flange of the Zygænas. The formula of the larval tubercles seems to be the same as that of the newly-hatched Zygæna. After the trapezoidals and supra-spiracular, we find a subspiracular, placed well below and slightly behind the spiracle, with three points placed in an equilateral triangle, of which two, an upper and an anterior, carry long hairs (IV and V), the third, below and behind, is merely a point; below this are two others (VI and VII) on the same level, half-way between the subspiracular and the prolegs (marginal). Of the larger larvæ the general skin surface is closely set with extremely fine hair-points, then there are numerous minute tubercles each carrying four to six short, apparently tubular bristles, these seem to be quite independent of the ordinary tubercles.

In the newly-hatched larva, the subspiracular tubercles are a posterior one, below but well behind the spiracle, and another rather lower and directly below the

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spiracle, there is no trace of the third hairless point of the larger larva, nor of the tubercles being fused into one. The next tubercle is very low down, ventral rather than marginal, solitary, carrying one hair like the others. There is also a black plate on the dorsum of the second segment.

The female pupa is much less like the larva than the imago is. Anteriorly it resembles the larva, slightly obscured in colouring and with the head bent down in front of the thorax, and hardly a trace of true legs. The head is like that of the larva with the appendages dwindled and atrophied; the antennæ are conical prominences, and the labrum, labium and mandibles appear as slight projections. The bending forwards is really that of an ordinary pupa, a bending usually obscured by the presence of the wing- and leg-cases filling up the hollow in front. These anterior segments are quite soft and larva-like and may be regarded as free, though the pupa does not move. The terminal segments (5th to 10th abdominal) are enlarged, forming a rounded mass which makes the whole pupa look very like one of those toy tumblers that always stand upright on a hemispherical base. These posterior segments, unlike the anterior ones, are more of an ordinary brown pupal texture, but the larval markings are still visible, appearing to be deeply buried within them. It would not be correct to describe these segments as "fixed," since there are no incisions soldered together; the incisions are fully on the stretch and are of nearly the same texture as the rest of the segments. The spiracle of the first abdominal segment is of course fully exposed, there being no wings, and there are circular patches, as in the imago, marking the position of the ventral prolegs. The first thoracic spiracle cannot be detected; there is a point marking the position of the second. The spines on the anterior margins of the segments are microscopically small.

On emergence the pupa protrudes the head and several segments from the cocoon, and the pupal case opens by a slit beginning transversely behind the head, thence passing down each side to the third thoracic segment. This portion of the pupal case is very elastic, so that, as the moth emerges, the anterior and posterior flaps thus formed stretch forwards and backwards into a plane and, whilst the moth is outside, open widely something like the upper

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and lower jaws of one of these reptiles whose gape is 180°. Their edges are smoothly continuous by the stretching of the material at their angle of union in the last thoracic segment, so that there is in fact no such angle or any danger of the slit continuing further down the pupa, the upper and lower sections being continuous, without any appearance of being separated by an open fissure or crack.

The moth when emerged retains an organic connexion with the pupa-case, and this is its most unusual feature. The imaginal legs, or rather the positions they should occupy, remain inseparable from the minute black papillæ that represent them in the pupa. If any attempt be made to separate the imago from the pupa case at this point, the pupal legs break away from the rest of the case, or more frequently, the separation is made at the expense of the imago, leaving bleeding wounds. The imaginal head continues also to occupy the pupal head; only twice have I seen it separated naturally, but it is not very difficult to extricate the head of the imago from that of the pupa. The imaginal head is almost identical with the pupal head, except that it is white and colourless and obviously not intended to be exposed, the antennæ and mouth parts existing as structureless elevations.

This, however, is not the only means by which the moth maintains its position. Organically connected with the anterior flap of the pupa case, the moth lies across the open mouth of the pupa, and its hinder extremity lies along the dorsal flap, formed of the dorsal thoracic segments. The ventral surface of the moth is swollen, so as exactly to fit the hollow these form in their inner surface, and there it adheres either by the suction of atmospheric pressure, or by an actual stickiness of the apposed surfaces. The bulb of the posterior segments of the pupa being still within the cocoon, the moth appears to be sitting across the mouth of the cocoon, the pupa case not being visible on a casual glance, though the moth is in contact with it throughout its whole ventral surface, except just centrally opposite the lumen of the chrysalis case. Fertilisation occupies five or ten minutes only, and this may be the whole duration of the imaginal existence outside its pupa case, since, as soon as this is accomplished, the moth commences to return into it and completes the process in about an equal time. Strong vermicular movements

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reverse the process of emergence; these movements, however, pass backwards along the posterior surface and past the anal extremity, and forwards along the ventral surface. The full rounded extremity of the moth maintains its apposition with the dorsal jaw of the pupa case, which it glides along until it comes over the opening into the pupa case, into which it then goes by an ordinary vermicular movement.

The moth is thus replaced exactly into its former position in the pupa, the elastic jaws resuming their natural relations, and appearances are almost precisely as if the moth had never emerged. As a matter of fact, the dorsal plate of the prothorax overlaps the head, thus closing the opening more completely, but even so, a close examination is necessary to recognise the difference from an unemerged pupa.

The process of oviposition then commences and apparently lasts for some days, the denser bulbous part of the pupa case being packed with eggs, the moth acting as a stopper over them in the upper part.

Though little more than a bag of eggs, the female imago has a well-developed set of cutaneous muscles, in longitudinal, transverse and diagonal bundles, very much the same as may be demonstrated in the larva, and as are figured by Lyonet and others in the larvæ of other Lepidoptera.

The eggs are ovoid, yellow and delicate in texture, not unlike those of Zygænas and, like them, have a transparent space at one end. They do not appear to be laid in any particular order or arrangement, but adhere so firmly to each other and to the pupal shell, that any attempt to individualise them only results in smashing them. If exposed, as by breaking the chrysalis case and removing the moth, they very soon dry up and shrivel. A chief object, probably the chief object, of the remarkable modification of structure and economy in the female of *H. penella*, is evidently the protection of the ova from predaceous enemies and parasites, no doubt, but most especially from the danger of desiccation. That this is an object most necessary to be attained, will appear when we remember the high temperature and arid character of the country where the species is most plentiful, such as the neighbourhood of Digne. It seems to be very effectually carried out by the thick, elastic, gutta-percha-like texture

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of the rounded posterior part of the pupa; brittle though this may be when its functions are completed and it is dried up, it is very tough and impervious whilst in use. Above, the moist body of the moth covers the eggs and is itself sheltered from evaporation by the anterior part of the pupa case. The cocoon again must prevent any very rapid circulation of air outside, and the eggs themselves form a dense solid mass.

Protection of the eggs against evaporation, or rather against desiccation, is a matter of imperative necessity for all insects in a hot and dry climate, and, indeed, under most circumstances. Usually, at least with our British Lepidoptera, this is secured by a position on or amongst herbage. Frequently laid on a leaf, the lower surface is thinner than the upper and absorbs moisture from the leaf as quickly as it evaporates from above. A very dense shell is another expedient, as in *Orgyia antiqua*, which has to exist for a long period, otherwise unprotected and unassisted. One advantage of the position in which the eggs of *Micropteryx* and Adelids are laid, viz., inside the plant tissues, is its moisture. One use, probably of the ribbing and flanging on the eggs of many butterflies and Noctuæ, is the impediment it offers to a rapid circulation of air over the egg surface, and those eggs that are enwrapped with hair and scales by the parent moth, benefit most from it, probably by the protection against desiccation so afforded. It is certainly not as a protection against cold, as its suggestion of blankets and swansdown at first makes us believe. It is not to hide them, since in most cases it makes them more conspicuous. It may be to make them more difficult of access to smaller foes, and unpalatable to larger ones. But no one who has tried to clean such an egg of its covering, and found how closely it is covered with scales and hair, and how difficult it often is to get a view of even a portion of egg shell after prolonged efforts to clean off the scales, can doubt that they must be very efficacious in preventing evaporation, both by their own thickness and that of the gum which attaches them so closely, and by their loose outer layers. Probably not a few of the less understood peculiarities of eggs have some reference to this protection.

Without denying that the protection provided in *H. penella* may be against enemies and parasites, as well as against drying up, it must be regarded as a remarkable

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instance in having led to such extreme modifications of both the pupa and imago of the female moth and of her habits.

It is difficult to understand how the dispersal of the species is effected, and how a new area of its food plants gets colonised. The newly hatched larva is an excellent wanderer but is too small to cover any distance, and the older larva is very sluggish. What I have interpreted as a desire of the female larva to hide her cocoon, may be the result of some wandering that is instinctive at this period. Its chief resource for dispersion probably lies in the fact that it will eat almost anything papilionaceous and even other things, and so may manage to exist precariously across intermediate country.

When the young larvæ hatch they eat up the remains of their mother, leaving only a few fibrous shreds and some pellets, probably of urates. When emerged the moth does not void any ejecta or other fluid as nearly all insects do on exclusion, and the necessarily present effete material is no doubt represented by these pellets. The larvæ make their way out of the pupa case by the opening left in it, and also by forming some very small holes for themselves, but beyond this they make no attempt to eat the pupa case itself, which remains nearly uninjured. They are at first fairly active little wanderers, but are too small to travel any considerable distance; they feed readily, and Mr. W. H. B. Fletcher, to whom I sent some, tells me that when in their third skin they prepare for hibernation by forming a little cocoon, in size and form not unlike that of a *Nepticula*.

When we come to the male pupa, which presumably has not suffered any of these special adaptive modifications, we find that to be the case. There is nothing definite to distinguish it from one of *Zygæna*, except the very large antenna case, which overshadows the other appendage cases in front, and may be the reason why no femur case exists between the maxilla and first leg. It is black and shining, with abdominal segments 1 to 7 all free. The maxillæ are short, the antenna cases cover the second legs, the tips of the third legs project. The appendage cases extend to the end of the sixth abdominal segment. The pupa is deep from back to front about the seventh and eighth (third and fourth abdominal) segments, has a very marked waist (first abdominal seg-

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ment) and tapers to the posterior extremity. The dorsal anterior margins of the abdominal segments are rough with longitudinal wrinkles on the fourth becoming very definite spines which on the later segments up to the eighth are placed two, three, and four deep, in irregular alternating rows. There is a certain amount of lateral flanging (as in *Zygæna* and *Procris*), that is, a soft wrinkled area leaves the harder parts in some degree as dorsal and ventral plates. In this flange some trace of the lateral yellow band of the larva still remains. The appendages are extremely polished and smooth, and are easily separated from each other. There is a large dorsal head piece, no trace of maxillary palpi; all seven abdominal spiracles are exposed.

For emergence the pupa projects from the cocoon through a loose valvular opening and remains there afterwards.

On dehiscence the eye pieces separate from the dorsal head pieces, and remain attached in front. In an empty pupa case the labrum, mandibles and well-developed labium are all very distinct.

In the male imago, the frenulum is interesting as consisting of a bundle of hairs, which are all separate at their bases, but unite into a solid bristle above; the frenulum has the appearance of being compounded in many species, but I do not remember it to have been actually resolved into its constituent hairs for a portion of its length in any other species I have observed.

The general surface of the wing-membrane is tinted as with a wash of indigo. In the forewing, a small portion at the base of the inner margin, corresponding with the jugum in the Jugatæ, is folded over on to the wing, the fold being clear of tinting and studded, as the rest of the wing is not, with very fine hairs. The corresponding portion of the hindwing is much larger, and is similarly marked off by a colourless line or area, from the base to the hind margin, where there is a notch.

The male pupa, the egg, larva and, I think, the imago all point to a close relationship to the Zygænidæ, but at a considerably lower level, as is chiefly evidenced by the larval tubercles and prolegs. The pupa also is probably lower, having the parts even less firmly soldered. Though one does not look to the female pupa for much light on the affinities of this form, owing to its being so specially

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modified, it gives us, I think, this information, otherwise unattainable, that not only are all the forward abdominal segments "free," but the thoracic ones are so also. In the male pupa this is obscured by the appendages being partially soldered together, and fixing the body; but with the information obtained from the female pupa it may be inferred that we are correct in regarding the opening of the thoracic incisions on dehiscence as a proof that they are not fixed segments.

The resemblance to Psychids appears to be entirely superficial. The Psychids are clearly derived from a Tineid stirps and have a pupa associated with many Tineids in its amount of specialisation. Assuming a relationship of *H. penella* to Psychids, then it must have branched off before *Psyche* left *Tinea*, *i.e.*, before it had made the first steps to a vermiform female, before in fact it was a *Psyche*. On the other hand, the larval prolegs show that *Heterogyna* has been an external feeder, at least, for a long time, and in this respect it is as much above *Psyche*, as pupally it is beneath it. In other words, we have to go a long way outside the Psychids to find a common point of relationship; or, in the usual way of expressing such a degree of relationship, there is no relationship at all, that is beyond their both being somewhat generalised forms in many respects.

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XI. Neuroptera-Planipennia *collected in Algeria by the Rev. A. E. Eaton.*

By ROBERT MCLACHLAN, F.R.S., &c.

[Read April 4th, 1898.]

I HERE enumerate the species found by Mr. Eaton in various parts of Algeria, during his stay in that country from the end of 1892 to the middle of 1897, interrupted only by occasional short visits to England. Mention is occasionally made of materials from the same region from other sources, according to specimens in my collection, but only when the same species are concerned.

The number of species is not large, but nearly everything is recorded from the country for the first time, and a few new species are described.

The general aspect of the materials is Mediterranean with occasional extensions to Asia Minor and Central Asia. No Panorpidæ, Sialidæ, Rhaphidiidæ, Mantispidæ, or Dilaridæ were found, but I have seen a *Mantispa* from Algeria, and the other Families probably exist there. Much remains to be done in the forests of the higher districts.

The Family Coniopterygidæ is not included. There is a considerable number of the minute insects representing this Family, and of four or five species, which will, I hope, receive attention in another paper.

MYRMELEONIDÆ.

Palpares hispanus, Hag.

Hab. Médéa, north side of Koudia Sma, about 3,180 ft., and another locality in the vicinity, July 1893; Constantine in June 1895, 2 ♂ and 2 ♀. Probably it is distributed all over Algeria, and is the species noticed by Lucas as *P. libelluloides*.

P. libelluloides has been recorded as occurring in Marocco, but in the Entomol. Monthly Mag., xxv, p. 346, when writing on Neuroptera captured by Mr. J. J. Walker in Marocco, I implied a doubt as to confusion with *P. hispanus*, and at the same time gave distinguishing characters for separating the two.

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Palpares angustus, sp. n.

Head and thorax above yellowish-ochreous with a cinereous tinge: face whitish yellow: palpi blackish piceous, the labial about thrice the length of the maxillary, second and third joints nearly equal, clavate at the tips; mandibles shining black; antennæ black, about as long as the pro- and meso-nota united: pronotum much broader than long, narrowed anteriorly, clothed with cinereous hairs, a broad median black longitudinal band (continued on the meso- and meta-nota and as a fine line on the hinder half of the vertex), sides broadly black, the disk divided into three raised portions by two deep transverse impressed lines; on the meso-notum (in addition to the black median band) there is a fine curved black line on each lateral lobe and the black margins of the pronotum are also continued here, but narrower, and more vaguely also on the meta-notum: underside of thorax cinereous clothed with whitish hairs: legs black (coxæ cinereous), with short stiff black hairs and fine adpressed cinereous pubescence: abdomen above olivaceous, becoming darker, and finally blackish, towards the apex, black beneath from base to apex, base clothed with rather short whitish hairs; appendages of ♂ short (5 mm.), black, cylindrical, much curved, gradually clavate to the obtuse apex, clothed with dense short black hairs.

Wings of ♂ long and narrow, the two pairs of about equal breadth, the anterior slightly longer; costal edge straight, the costal area narrow; inner margin gradually rounded and slightly sinuate in the apical portion; ground colour whitish hyaline, more decidedly whitish in the posterior: anterior wings with the neuration mostly whitish (but the radius and upper cubitus nearly wholly black) rather closely and nearly evenly sprinkled with small black points, forming a double row along the inner margin from the apex, costal nervules mostly with a black point at each end and another in the middle; there are also four fasciate black spots, (1) at about $\frac{2}{7}$ths from the base small and not extending half across the wing (almost connected with larger points on the branch of the lower cubitus), (2) before the middle extending half across, sometimes interrupted or sometimes only an isolated discal spot, (3) somewhat oblong, going half across, often broken up in the lower half (all these start from the radius), and (4) a pterostigmatic series of connected spots with an elongated linear one below them; pterostigma small, whitish; the sector radii originates in the first fasciate spot, and it has a branch directed towards the base; posterior wings without the small black irrorations (save a few at the base of costal nervules), but with a series of rather large, more or less connected, black spots along the inner margin (except on the basal portion);

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4 black transverse fasciæ, viz.: (1) a reniform spot placed just beyond the fork of the lower cubitus, (2) a band before the middle, starting from the radius, dilated in its lower portion (not reaching the inner margin), and sometimes emitting a process directed towards the base, (3) a broad band starting from the costal edge, and extending more or less to the inner margin (where it is often connected with the row of spots), very irregular on its inner side, and often produced in a K-shaped manner, (4) an apical band more or less broken up by spots of the whitish ground.

Length of body, ♂ with the appendages 61 mm. Expanse 107 mm. Greatest breadth of anterior wing 14 mm.

Hab. Biskra, 11th and 15th June, 1897, 2 ♂.

Mr. Eaton notes that it rests by day on shrubs, but easily takes alarm, and then mounts in the air out of sight.

P. angustus, var. *oranensis*, nov.

Differs from the type from Biskra in its slightly larger size, the black points on the anterior wings larger and more numerous, the fasciate bands broader and more distinct, much more so in the posterior wings.

In the ♀ the abdomen is apparently wholly olivaceous, femora externally olivaceous. Wings broader, the pattern of the markings essentially as in the ♂, but the transverse bands are broader and more distinct, especially in the posterior, where band 3 forms a very broad irregular K.

Length of body, ♂ with appendages 65—66 mm., ♀ 45 mm. Expanse ♂ 112—120 mm., ♀ 126 mm. Greatest breadth of anterior wing ♀ 19 mm.

Hab. Méchéria, Oran (*L. Bleuse*), 2 ♂ 1 ♀.

The character of the markings of the wings is extremely unstable both in the type form and variety, and is seldom alike on the opposing wings of the same individual.

This species seems to be distinctly related to *P. patiens*, Wlk., from India, *P. walkeri*, McLach., from Aden, *P. solidus*, Gerst., from Mesopotamia, and probably also to *P. cephalotes*, Klug, and *P. papilionoides*, Klug, from Arabia.

Gymnocnemia variegata, Schnd. (*Aplectrocnemia multipunctata*, Costa).

Hab. Médéa, between Dakela and Lodi, one example. A wide-spread insect over the Mediterranean Region and

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extending to Turkestan; always apparently very rare, but no doubt owing to want of systematic searching.

Creagris plumbeus, Oliv.

Hab. Algiers, on the ramparts, 3rd May, 1893; Sidi-Ferrouch, on the coast west of Algiers, 8th May, 1893; Azazga, at light in the inn, 13th September, 1893; various localities about Biskra in May and June, 1894; 13 examples in all.

Those from Algiers and neighbourhood equal the largest South European examples, those from Biskra are distinctly smaller. The markings on the pronotum vary. In all (excepting one ♂ from Biskra) the dark interruptions on the neuration are absent or scarcely visible, but examples from Sicily are similar in this respect. I possess the species also from Tiout and Méchéria in the province of Oran (*L. Bleuse*).

Hagen has pointed out (Stett. ent. Zeit., xxvii, p. 289) that the probable range of this insect is very great, if certain forms presenting slight differences are considered as scarcely worthy of separate names. The same form (slightly modified) would thus extend over all the Mediterranean region, the whole of Africa to the Cape of Good Hope, Asia Minor and Central Asia, and probably to India and Ceylon if *C. perfidus*, *sedulus* and *adversus*, Walk. (scarcely separable *inter se*) be considered.

C. murinus, Klug (a synonym of *plumbeus*) is given by Hagen (l. c.) following Schneider, as extending from Syria to the Cape of Good Hope, and further on (p. 402) as from the Cape only. Klug, Symb. Phys., gives Syria as the locality, and on pl. xxxvi, fig. 5 it is indicated as *syriacus*, a name that does not occur in the text.

Myrmeleon lugdunensis, Villers, has been identified with *C. plumbeus*. Could this be sustained that name would have priority; the very short description does not convey to my mind any indication that Villers had this insect before him.

Myrmecælurus atrox, Walk.

Hab. Biskra, 3rd June, 1894, 3 ♂, 2 ♀. Practically agreeing with Walker's type from Turkey; the Indian *M. acerbus*, Walk., is perhaps not different. Differing from typical *M. trigrammus*, Pallas, in its smaller size, in

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the absence of the strong yellow tinge on the wings, and in most of the longitudinal nervures (and parts of the neuration otherwise) being interrupted with blackish of which there is rarely a trace in *M. trigrammus*: in this latter respect it agrees with Klug's description of *M. lætus* from Arabia Deserta: "alæ hyalinæ, nervis fusco-albidoque-variegatis reticulatæ;" this latter is usually considered a synonym of *trigrammus*.

I have undescribed species of the genus from the Province of Oran.

Macronemurus appendiculatus, Latr.

Hab. Médéa, 27th June, 1893, Constantine, 14th and 16th June, 1894, Bône, 11th June, 1896, Le Tarf, 24th June 1896. 4 ♂, 1 ♀. Also from Perrégaux, Oran (*L. Bleuse*).

Macronemurus elegantulus, sp. n.

Pale yellow. On the antennal region is a large blackish space (in which the antennæ are seated) forming a broad shining black triangle below the antennæ the lower edge of which is slightly excised (like a broad ⋀): antennæ brownish black, the two basal joints yellow, somewhat annulate with brownish beneath; on the swollen vertex is a blackish ♈-shaped spot: pronotum scarcely longer than broad, very slightly narrowed anteriorly, on the middle a broad blackish longitudinal band the whole length, dilated anteriorly, and on each side a narrow abbreviated blackish line, not reaching the anterior margin; mesonotum with a very broad median black band dilated anteriorly, and another on each side at the base of the wings: metanotum having the anterior lobe margined with blackish, and a spot on each of the other lobes; on each side of the thorax a blackish maculose band: legs pale yellow, anterior and intermediate tibiæ spotted with black externally, tibiæ at apex and the tarsal joints at their apices furnished with black spine-like hairs, on the back of the posterior femora of the ♂ is a series of long curved hairs diminishing in length towards the apex: abdomen for the most part blackish but with a (sometimes obsolete) yellowish maculose stripe on each side, clothed with short whitish hairs; appendages of the ♂ as long as the last two segments, curved, cylindrical, yellowish, clothed with long hairs.

Anterior wings narrow, only slightly dilated to the apex which is scarcely angulate, the posterior slightly shorter: hyaline, the edge all round finely blackish, neuration for the most part whitish, but the costal nervules are usually slightly fuliginous, as are those in

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the disk, and occasionally the subcosta is faintly marked with fuliginous, network rather open, pterostigma opaque yellowish, wing-roots yellow.

Length of body ♂ (with appendages) 17—21 mm., ♀ 17—21 mm. Expanse 36—40 mm.

Hab. Biskra, May and June, 1894, also Méchéria, South Oran (*L. Bleuse*), about 18 examples in all. Two ♂ from Aïn Séfra, South Oran, differ slightly in having the neuration nearly wholly fuliginous, but not otherwise.

This small species should be allied to *M. linearis*, Klug, from Syria, but can hardly be identical therewith, differing especially in the markings of the pronotum according to the description.

I direct attention to the long hairs on the posterior femora of the ♂ mentioned in the foregoing description. These are present, and even in a more marked degree, in several undescribed species, and they probably exist in some already described, but they are wanting in the two larger species—*M. appendiculatus* and *M. bilineatus*.

Myrmeleon oulianini, McLach.

Hab. Biskra, 2nd June, 1894, 2 ♂. I have also 1 ♀ from Méchéria (*L. Bleuse*), and another ♀ from Suez (25th June, *J. J. Walker*).

These individuals vary somewhat *inter se*, but all pertain I think to one species, identical with the type (not now before me) from Turkestan described and figured in the Neuroptera of Fedtschenko's 'Turkestan'; the figure should serve for identification. The ♂ has two short cylindrical appendages at the apex of the abdomen after the style of *Macronemurus*, but very much shorter, and not sufficiently indicated in the figure on account of the position. Eventually a separate genus (allied to *Myrmecælurus*) will probably be formed to receive the species. I was inclined to place it in *Brachynemurus*, an American genus founded by Hagen, but the shorter spurs of the Old-World insect, or rather the longer first tarsal joint, scarcely accord: yet *Brachynemurus* is made up of by no means congruous materials, such species as *B. sackeni* having a longer first tarsal joint than the others, and ♂ appendages that rival those of *Macronemurus* in length.

I believe that the range of the same species from Algeria to Turkestan has been long proved in entomology.

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In addition to *M. oulianini*, I may cite the curious *Myrmecælurus fedtschenkoi*, McLach., which occurs in the Province of Oran in a slightly modified form.

M. oulianini is so closely allied to the Indian *M. morosus*, Walk., as to induce a suspicion that it may be only a form thereof. *M. infensus*, Walk., also from India, would be a generic ally on a subdivision, as would certain South African species, such as *M. trivirgatus*, Gerst., &c.

Myrmeleon distinguendus, Rbr.

Hab. Biskra, 3rd June, 1894, two examples, larger than others from Portugal (?) and Marocco in my collection.

This insect might be overlooked as a small *Creagris* were it not for the neuration and spurs. Schneider, Stett. ent. Zeit., vi, queries this species as identical with *M. cinereus*, Klug; I think the identity very probable.

Myrmeleon microstenus, sp. n.

Body slender, blackish, clothed with short sparse whitish pubescence: antennæ about as long as the pro- and meso-thorax united, the club stout but gradually formed, colour blackish, faintly ringed with yellowish at the sutures, the basal joint entirely and the second beneath pale yellow: head blackish above, varied with yellow, a yellow transverse band at the top of the declivous portion in which is an angulate row of six small black spots, a large black space occupies the antennal region, continued between and below the antennæ as a small ∧ -shaped mark, face pale yellow, labial palpi pale yellow with a small blackish spot on the clavate terminal joint externally: pronotum twice as long as broad, narrow, its sides parallel, with a constriction at the transverse sulcus just before the anterior margin blackish with indications of three fine longitudinal whitish lines, and anteriorly on either side with a ⟨-shaped whitish spot angulate in its middle where intersected by the transverse anterior sulcus: mesonotum blackish with indication of a median whitish line and two short parallel similar lines on each side lobe, the postscutellum with a whitish median line and whitish margins; sides blackish obscurely varied with whitish, pectus whitish yellow; legs slender, whitish; anterior coxæ with a black mark externally, the femora blackish externally with a pale ring before the apex, tibiæ whitish with a black ring externally before the middle and another at the apex, tarsi (and in all the legs) whitish with the second to fourth joints wholly, and the fifth at the apex, black; intermediate and posterior femora with some black points externally and a black half-ring before the apex, the same applying to the tibiæ also only

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the points are less numerous, and the apical ring more distinct; hairs of legs whitish with a few blackish intermingled; first tarsal joint longer than, and the fifth as long as, the 2nd to 4th united; spurs slender, testaceous, longer than the 1st tarsal joint in the posterior legs, and equalling the first 3 tarsal joints in the anterior; abdomen slender, blackish, a whitish spot on each side of the segments after the second, placed near or at the anterior end, elongate on the third segment but becoming more rounded on the apical segments (partially obliterated by desiccation), the narrow terminal segment yellow, furnished ventrally with apical black spines (♂ ?).

Wings long and narrow, subacute, the posterior somewhat shorter, hyaline; neuration whitish interrupted with black, causing a variegated appearance, especially on the anterior, where there is a series of seven or eight short black lines along the radius, the last forming a spot before the junction of the radius and subcosta, another spot (almost united with the preceding) at the junction and invading the pterostigma which is otherwise whitish, some larger black lines along the lower cubitus, and one at the junction of the lower branch with the hind margin, a conspicuous slightly angulate oblique black line along the inner series of (about 8) gradate nervules, the axils of the marginal furcations blackish, as are also most of the transversals; in the posterior the black marks are nearly absent, that at the pterostigma being the only one at all noticeable; in the anterior the sector radii has its origin near the middle of the wing, but in the posterior it commences much nearer the base.

Length of body, 17 mm.; expanse 39 mm.; greatest breadth of anterior wing 5 mm.

Hab. Biskra, 26th April, 1895, one example at light.

A very delicate little Ant Lion, deceptively resembling *Gymnocnemia variegata*. Allied to *M. nemausiensis*, Bork. (*i.e.*, to the true species of that name, *cf.* Entomol. Monthly Magazine, xxv, p. 345), but more delicate, and with the pronotum differently marked, &c. Also probably allied to *M. tenellus*, Klug, but I do not think it can be identical therewith according to the description and figure. Lucas recorded *M. tenellus* from Algeria, but it is not possible to determine the exact species without examining the material.

In Hagen's "Synopsis Specierum" (Stett. ent. Zeit., xxvii, p. 148), *M. tenellus*, Klug, is referred to the genus *Creagris*, but the figure does not show the neural character of that genus, and Weber's figures are usually of extreme accuracy.

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ASCALAPHIDÆ.

Bubopsis (n. nov.*) *eatoni*, sp. n.

Black; head and thorax clothed with very dense white pilosity, in which is a tuft of black hairs on the posterior edge of the vertex between the eyes, and a row of black hairs on the front part of the mesonotum; labrum and clypeus pale yellow (the rest of the head above concealed in the pilosity), back of head pale yellow, with a semicircular fuliginous mark on either side: antennæ much shorter than the wings, blackish (not annulated), but pale yellow before the broad flattened club which latter is yellow in its basal and blackish in its apical half; pronotum pale yellow; mesonotum black with large yellow spots, whereof two on the scutellum are conspicuous; legs black, the femora beneath and the tibiæ externally pale yellow, femora and tibiæ clothed with white pilosity, and with longer blackish spines on the tibiæ and tarsi, spurs and claws blackish piceous: abdomen black with a cinereous tinge, a yellowish spot on each side of the posterior margin of each segment, a yellow lateral line, beneath there is a yellow spot on each side of the first segment and the margins and posterior edge of the second are also broadly yellow; appendages of the ♂ long (6.5 mm.), subcylindrical, gradually divergent from the base, and again convergent towards the apex, enclosing a very broad oval space, the apices slightly outcurved and applied one against the other, beneath at about half its length each appendage emits a long (4 mm.), slender, cylindrical branch, directed downward and backward, the opposing branches touching at the tips, and there slightly thickened; on the superior outer edge of each appendage beyond the middle is a geniculation, which is produced into a distinct (about 2 mm.) short stout cylindrical branch, curved slightly inward, and provided with black teeth at its obtuse apex; in colour the appendages are for the most part yellow, but black above and externally in the basal half and the tips of the branches are also black, they are clothed with short spinose hairs, which are very dense on the inner apices, and each appendage has also a dense inner fringe of fine white hairs in its basal half.

Wings moderately broad, hyaline, the wing-roots yellowish; neuration black, but the costal margin, the subcosta, and the sector radii (the latter indistinctly) are whitish, the subcosta with a short black streak at the base of each of the costal nervules (a few of these latter are whitish towards the base); 23 costal nervules in the anterior, and 19 in the posterior wings; 6 and 5 cellules before origin of the sector radii, 5 branches to the latter, of which the first is

* *Bubopsis* = *Bubo*, Rambur (1842 restricted), preoccupied in Aves.

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distant from the others which are parallel; pterostigma whitish, enclosing four strong black nervules, of which the outer is forked at the end; poststigmatic area in the anterior wings, consisting of a lower row of 5 large cellules and an outer row of 10 or 11 small cellules, with one or two cellules interposed, in the posterior the outer cellules are larger, and there are apparently no interposed cellules.

Length of body without appendages, 10 mm.; length of appendages, 6.5 mm.; length of anterior wing 29 mm.; greatest breadth of same, 7.5 mm.; expanse 60 mm.

Hab. One ♂ from a hill-top near Biskra, 1st May, 1897.

Very distinct from *B. hamatus*, Klug, and *B. agrioides*, Rambur, (which appear to be closely allied) by the comparatively broader wings, the colours of the body, and the distinctly white costa and subcosta, and still more so by the character of the ♂ appendages, which although formed after the same plan, differ greatly in details, such for instance as the outer curve which causes them to enclose a nearly circular space, and especially in the *branch* formed at the point of geniculation, there being only a rounded tubercle at this point in the species just alluded to.

The species figured in Savigny's "Déscription de l'Égypte," pl. 3, fig. 2 (1) cannot belong here, neither do the appendages accord with those of the other species unless they were distorted in some way.

The *Bubo hamatus* noticed and figured by Lucas in the "Exploration scientifique de l'Algérie," Insects, p. 137, pl. iii, figs. 5 and 5A, cannot pertain here, nor can it belong to the same genus, inasmuch as the ♂ has no prominent appendages. Probably it is a *Siphlocerus* or allied thereto. I have more than one species (at present undescribed) from Algeria that should perhaps be placed in that genus.

Bubopsis gravidus, sp. n.

Blackish, varied with piceous, clothed with long and dense cinereous hairs on the face, vertex and underside of thorax, and with short and sparse cinereous hairs on the thorax above; face ochreous yellow, back of head brown; antennæ much shorter than the wings, black up to the short and thick club, which is wholly yellowish; thorax varied with reddish piceous above and on the sides; legs wholly reddish yellow, the tarsal articulations scarcely blackish, claws

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piceous: abdomen discoloured (through decomposition of eggs?), but with indications of having a broad dorsal and ventral reddish piceous or yellowish stripe.

Wings comparatively broad, hyaline, but with a smoky tinge (probably wanting in less mature individuals) which in the posterior becomes smoky yellowish, wing-roots reddish piceous; neuration black, but the costa and subcosta are reddish brown; 23 costal nervules in the anterior and 18 in the posterior; 6 and 3 cellules before origin of sector radii, which has 5 branches; pterostigma pale brown enclosing 3–4 black nervules; poststigmatic area with a lower row of 5 large cellules and an outer row of 8 or 9 smaller ones in the anterior, 3 large lower cellules and about 5 smaller and outer in the posterior.

Length of body 25 mm.; length of anterior wing 29 mm., greatest breadth of same 8 mm.; expanse 61 mm.

Hab. One highly mature ♀ from Azazga, 6th Sept., 1893, at light in the inn.

It is scarcely possible that this can be the ♀ of the preceding species, neither can it pertain to *B. hamatus* or *agrioides*.

Ascalaphus ictericus, Charp.

Hab. Constantine, 17th and 18th May 1895. A widespread species in Algeria.

NEMOPTERIDÆ.

Halter barbarus, Klug (*Nemop. algirica*, Rbr.).

Hab. Aïn Kriar, 22nd June, 1896, on sandy ground in the "scrub" near the W. base of Djebel Ouast. Mr. Eaton remarks:—"Common at La Calle near the sea, especially on the hill W. of the town." A well-known Algerian species.

I have recently described (Bull. Soc. Ent. France, 1898, p. 169) a small species of this Family under the name *Croce chobauti* from Ghardaia in South Oran; and M. Brongniart has recorded the occurrence of *Halter* (?) *imperatrix*, Westwood, from somewhere in the same district (Bull. Mus. Paris, 1896, p. 30), which is very remarkable if his identification be correct, the species belonging to tropical West Africa.

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OSMYLIDÆ.

Sisyra iridipennis, Costa.

Hab. Le Tarf at the Krelidj Zaora, 19th June, 1896, one example agreeing precisely with types from the island of Sardinia received from Costa.

A species remarkable for the black head and thorax and shining black first and second joints of the antennæ, the rest of the insect being pale yellowish.

HEMEROBIIDÆ.

Berotha eatoni, sp. n.

Head and thorax yellowish-cinereous, densely clothed with cinereous hairs mixed with blackish: antennæ shorter than the body, dull yellowish, first joint long and stout, but shorter than the head, slightly clavate, clothed with long blackish hairs, second joint cupuliform, about twice the length of each of those succeeding which are very numerous and transversely moniliform; eyes lead-coloured with a cinereous tinge; face very short; pronotum longer than broad, with a raised median longitudinal carina; mesonotum varied with fuscous; metanotum with a fuscous spot on each lobe: abdomen fuscous (discoloured?) with long and dense cinereous hairs, the apex yellowish, the inturned, slightly divaricate, filiform appendages about one-third the length of the abdomen, yellowish, clothed with very long outstanding pale hairs, the tips slightly thickened and blackish: legs yellowish with pale hairs, a black spot on the trochanters externally, a ring near the base of the femora and at the apex of the tibiæ, and the tips of the tarsal joints, blackish, first tarsal joint longer than the others united.

Anterior wings elongate, gradually dilated to beyond the middle, the apex obtuse, rounded, not excised, subcinereous, hyaline: neuration for the most part whitish, but closely set with deep black tubercles, whence arise long cinereous (blackish in certain lights) hairs, subcosta and radius almost entirely black; costal margin narrow at the base, and then rather suddenly dilated, afterwards straight, with about 13 transverse costal nervules before the end of the subcosta, all furcate and mostly twice forked, marked with black spots on the margin and with larger and more extended similar spots on the pterostigmatic region, the minute marginal furcations all round the wing marked with black spots, and there are small marginal tubercles between the nerve ends, the long marginal ciliations, pale, but blackish at the site of the black spots; the two transverse nervules in the area between the radius and sector, two cubital

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nervules near the base, and an oblique dislocated series of 5 gradate nervules on the disk, all deep black and margined with blackish; sector radii with four branches, upper branch of lower cubitus with three simple branches, the lower with two. Posterior wings hyaline, iridescent, narrower, shorter, and less obtuse at the apex, not excised; neuration for the most part whitish, but the small apical forks, and the base of the larger furcations are mostly black; the single dark black transversal between the radius and sector is margined with blackish, the only other transversals are two cubitals in a line towards the middle of the inner margin and another nearer the base; sector radii four-branched, arising much nearer the base than in the anterior; along the lower branch of the upper cubitus and the upper branch of the lower cubitus, towards the base, are a few long microscopic blackish scales.

Length of body 4·5 mm., expanse 13 mm.

Hab. Biskra, 24th April, 1895, one ♂ at light.

This interesting little insect is by far the smallest of the known species of the genus, and otherwise remarkable for the entire and *rounded* apex of the anterior wings.

I would call attention to some remarks by me on the presence of *scales* on the wings of this genus (of which *Isoscelipteron*, Costa, is scarcely more than a synonym) in the Entom. Monthly Mag., xxii, p. 215 (Feb. 1886); the scales are represented on the posterior wings of *B. eatoni*.

Neurorthus fallax, Rbr. (*Mucropalpus fallax*, Rbr., *Neurorthus iridipennis*, Costa, *Sartena amœna*, Hag.).

Hab. Frais Vallon, near Algiers, 27th October, 1892; Bouzaréa and El Biar, near Algiers, 3rd and 24th April, 1893; Bône, 28th May, 1896; one ♂ from each locality, all indicated as taken near a stream.

Although the type is not in existence I do not hesitate to apply Rambur's name according to the description and the locality (the island of Sardinia). I think only one species is known, but there is some amount of mystery to be cleared up. In the three specimens from near Algiers the abdomen is notably constricted before the apex, and in the ventro-lateral aspect of this constriction there is placed on each side a short filamentous appendage with a vague appearance of articulations; in the example from Bône the constriction is present without the filaments: in a type of *Sartena amœna* from Corsica, the constriction is

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present and again no filaments. In examples taken in July, 1893, by Prof. Klapálek at Dragalevci, Bulgaria, there is again the constriction but no filaments. These latter specimens are slightly larger. No mention of either constriction or filaments is made by Rambur, Costa, and Hagen in prior descriptions. Are these filaments fugacious, or are they extensile and retractile? Here is a point to be solved! If there be more than one species here mixed, the characters must be difficult to define. I may mention that one specimen from Bulgaria is evidently ♀, and has a somewhat acuminate ovipositor (or case for such) at the ventral apex of the abdomen. The habits are probably aquatic, unless the fact of the four specimens found by Eaton having been all taken near streams is only incidental.

Micromus aphidivorus, Schrk.

Hab. Constantine, 20th May, 1895, one example.

Hemerobius parvulus, Rbr.?

Hab. In the forest near Azazga by beating *Quercus suber*, 30th August, 2nd and 20th September, 1893, four examples.

Rambur's *Macropalpus parvulus* from the island of Sardinia has never been thoroughly understood. The species I identify with it (with some doubt) is the same as the *parvulus* of Costa according to a type. It is smaller and paler than *elegans*, Steph. (of which *pygmæus*, Rbr., is usually considered a synonym), and the wings are less strongly mottled. Yet in some respects the description of *pygmæus* reads as if that should be the smaller. I received examples from M. Jules Lichtenstein of Montpellier, who bred them from larvæ found in the galls of *Tetraneura ulmi* and *Pemphigus bursarius*. In the Algerian examples the markings of the anterior wings are more crowded on the apical and inner margins, and form distinct fasciæ on the rows of discal nervules, without markings between the fasciæ. I consider it as undecided whether the forms set down as *parvulus* may be only a small pale southern race of *elegans*, and also whether Rambur's *parvulus* and *pygmæus* may be only racial forms of the same species (*elegans*). It is most unfortunate that Rambur seldom gave any exact measurements in his descriptions, but contented himself with comparisons only.

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Megalomus pyraloides, Rbr.

Hab. El Biar near Algiers, 17th and 21st April, 1893, two examples.

Larger than specimens from Sicily, but apparently not distinct.

CHRYSOPIDÆ.

Nothochrysa capitata, F.

Hab. El Biar near Algiers, 21st April, 1893, one example in a spider's web.

Mr. Eaton did not find the striking *N. stigmatica*, Rbr., which is widely distributed in Algeria. I possess an example from Bône (*Pascoe*) and several from Aïn Séfra, South Oran (*L. Bleuse*). Lucas records it from La Calle.

Chrysopa clathrata, Schnd.

Hab. Biskra, 25th March, 1895, one example discoloured and somewhat doubtful.

I have an old specimen in my collection from Algeria, without locality, that is more typical.

Chrysopa genei, Rbr.

Hab. Biskra, 25th April and 8th May, 1894, 15th, 21st and 24th April, 1895, chiefly at light.

Chrysopa caviceps, sp. n.

Body pale yellow (scarcely tinged with green). Head above with a large excavation, the posterior edge of which is straight and the anterior semicircular, occupying the greater part of the disk; sometimes without markings above, but ordinarily with a more or less distinct crescentic brownish mark on the disk anterior to the excavation and a point of the same colour on each orbit; an elongate brownish black spot between the antennæ (often absent), a point on each side on the face under each eye and a short streak (often absent) on each side of the clypeus; palpi yellowish, varied externally with brownish, pale at the articulations; antennæ not longer than the wings, pale brown, narrowly paler at the articulations, microscopically setose, basal joint with a long black streak externally, and a shorter one internally (often absent or reduced to a point), second joint (normally) ringed with black. Pronotum broader than long, the anterior angles oblique, a transverse sulcus and indistinct

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longitudinal median impressed line, without markings, but the sides often somewhat brownish; rest of the body, with the underside, ordinarily without markings, but the thoracic lobes sometimes suffused with brownish; legs pale, tarsi somewhat obscure externally, claws testaceous, slightly, but gradually, dilated at the base, *i.e.* "simple" as opposed to the common condition in which the claws are suddenly dilated.

Wings rather broadly oval, obtuse, vitreous, iridescent; neuration open, mostly whitish, but the nervules are black at each end, and are furnished with distinct minute black tubercles, whence spring short black hairs, causing a distinct punctate appearance under the lens; pterostigmatic space long, greenish, with 3 or 4 somewhat thickened subcostal nervules beneath it; dividing nervule of third cubital cellule extending only slightly beyond the superposed nervule, 11—14 costal nervules in anterior wing, about 9 cellules between radius and sector, which latter is strongly angulate, gradate series parallel, 2—3 nervules in the inner and 3—4 in the outer (ordinarily 2 in the inner and 3 in the outer in the posterior).

Length of body 5·5—7 mm., expanse 16—21 mm.

The foregoing description has been made from eight examples (which I regard as typical), taken by M. L. Bleuse at Aïn Séfra in South Oran; and I have recently seen others collected much further south in the Sahara by Dr. Chobaut. I have also a series of eight examples taken by Mr. Eaton at Biskra in May and June, 1893 and 1894; the species seems to be common there. All these latter have the head more or less strongly suffused with sanguineous, causing quite a peculiar appearance. I feel sure this is due to the action of ammonia in the killing-bottle, nevertheless it seems advisable not to consider the Biskra examples as typical. It is highly probable that a similar change of colour from the same cause has occurred in the types of some exotic species.

C. cavifrons is clearly allied to *C. genei* and is about the same size, therefore one of the smallest species.

Chrysopa nana, McLach.

Trans. Ent. Soc. Lond. 1893, p. 231, September, 1893 (= *Ch. pretiosa*, Gerst., Mitth. Verein f. Neuvorpommern und Rügen, xxv, p. 158, 1894).*

Hab. Biskra, 3rd June, 1893, 1st May, 1894, 13th, 21st and 27th May, 1895.

* The "Mittheilungen" (xxv) for 1893 are dated 1894 on the cover.

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Sixteen examples at oil lamps in the town, those taken in April and May are less strongly irrorated. This pretty little spotted-winged species was originally described from Asia Minor; it occurs also in Persia.

Chrysopa formosa, Brauer.

Hab. Azazga, 13th September, 1893, at a lamp in the inn; Constantine, 20th May, 1895 : one rather small example from each locality.

Chrysopa prasina, Burm. (*aspersa*, Wesm.).

Hab. Constantine, 8th May, 1895; Le Tarf, 19th June, 1896.

One example from each locality, that from Constantine has the dark spots on head and thorax nearly obsolete.

Chrysopa lineolata, McLach. (*clathrata*, Ed. Pict. *nec* Schnd.).

Hab. Biskra, 15th April, 1895, one example at light, in which the neuration is very slightly varied with black, but of the identity of which there can hardly be any doubt.

Chrysopa flavifrons, Brauer.

Hab. Hassein Dey near Algiers, 12th April, 1893; Biskra, 3rd June, 1893, at light; Azazga, 11th September, 1894, at light; Constantine, 18th May, 1895; Le Tarf, 19th June, 1896.

An excessively variable series, but all apparently belonging here so far as one can judge from single examples from each locality.

Chrysopa mutata, sp. n. ? (*vulgaris* var. ?)

In size and general characters similar to somewhat small examples of *C. vulgaris*. Differs in most of the nervules being blackish, except in the middle, those in the postcostal basal area, and the gradate series, entirely blackish (very visible in certain lights); the ciliations on the margins and neuration apparently shorter (even than in Algerian examples of *vulgaris*); *only three nervules in the inner gradate series in the anterior wings* (ordinarily *five* in *vulgaris*).

Hab. Biskra, five examples in March, April and June.

It is the coincidence of the partially blackish neuration and the neural character mentioned above that induces me to think these examples have probably so far differen-

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tiated as to be worthy of specific rank. I have seen nothing of the same nature among European specimens of *vulgaris* and the differences seem more decided than in the form or condition known as *microcephala* (Brauer). In three of the examples the dividing nervule of the third cubital cellule is as in normal *vulgaris*, in the others it is coincident with the superposed nervule. The West-African *C. conformis*, Walk., is distinct according to the type, and specimens of *vulgaris* from South Africa, Natal and St. Helena (no doubt introduced) agree sufficiently with those from Europe.

Chrysopa vulgaris, Schnd.

Hab. Fort National, Algiers, Médéa, Azazga, Constantine, Biskra and Le Tarf.

About 25 examples, from nearly every month in the year; no doubt largely introduced with plants from Europe. Some of the examples taken in winter show slight darkening in colour, but the reddish and red-spotted conditions in hibernating examples in Britain are not represented. This is apparently the species recorded by Lucas as *C. perla*.

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XII. *A Revision of the Genus* Erebia. By Henry John Elwes, F.R.S., F.L.S., &c.

[Read February 16th, 1898.]

It is now nine years since I published some notes on this genus in the Transactions of this Society, 1889, p. 317, and gave a synopsis of the species then known to me. My attention was last year again strongly attracted to the genus by a paper by Herr H. Calberla (Iris, ix, p. 377) on *Erebia glacialis* and *E. melas*, in which he proved by a comparison of the genitalia of the male insects that the form which had been taken at Campiglio in South Tyrol by Mrs. Nicholl, myself and others, and which I had considered to be the missing geographical link uniting *E. melas* of Hungary with its supposed Pyrenean form *E. lefebvrei* was nothing more than a strongly-marked local variety of *E. glacialis*, which occurs as a rare aberration in some other places. I at once asked Mr. Edwards to employ his leisure in the dissection and examination of the genitalia of the other species of the genus, from which I expected that much help might be derived in the classification of what has always been a difficult genus, on account of its wide diffusion and great tendency to vary; and finding later that Dr. Chapman was working at the same subject, I placed Mr. Edwards's dissections at his disposal.

The result of their work has in some cases confirmed and in others modified the views which I previously held as to the specific value of characters, which are in some cases extremely variable; but as my knowledge of the genus has increased, I am rarely unable to name the most aberrant specimens without having recourse to the form of the clasps which, as Dr. Chapman's investigations show, are in most cases a certain guide to the identification of species, if sufficient study be given to them.

That this genus is one in which no one should be too confident about specific affinities without some other guide than colour and markings is well shown by the mistake I made about *E. glacialis*, and by an even more remarkable

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slip which Dr. Staudinger recently made, in describing and figuring as a new variety of *Erebia nerine* what he afterwards admitted to be nothing more than an ordinary *E. pronoe*. Therefore, though I have done my best to form a correct judgment from all accessible sources of information, it is probable I have not even now placed in their correct order some of the least known species of *Erebia*.

My thanks are due to many entomologists for the assistance they have given me in lending rare species of *Erebia* from their collections, especially to the Grand Duke Nicholas Mikhailovitch and his most obliging assistant M. Serge Alphéraky, who have added many rare Siberian species to my collection and lent many others for examination; to Prof. Aurivillius of Stockholm, who lent me some types from the Stockholm Museum; to Dr. Staudinger, to M. Charles Oberthür, to Dr. Chapman, Messrs. Leech, Tutt, Nicholson and others. I am sure that entomologists will also thank Sir W. Flower of the British Museum as heartily as I do for allowing the national collection of this genus, which had remained much as I found it nine years ago, to be properly arranged under the names which I have adopted in this paper, and though it is still wanting in a few of the rarer Asiatic species, yet by the incorporation of the Frey and Godman-Salvin collections it now contains a very good series of nearly all the European species.

The variation in the majority of the species of this genus is so great, that in many cases it is very difficult and in others impossible to draw up descriptions or analytical tables which will enable a person who has not a good knowledge of them to identify them. Staudinger remarks in his paper on the Lepidoptera of Greece as follows:—"When we consider how exceptionally great are the variations of the genus *Erebia* both as regards the presence or absence of the ocelli, the red bands or spots, the darker or lighter underside, &c., not only as local variations, but also as aberrations, we find a very rich material in proof of the Darwinian theory; and the more material we receive, so much more uncertain we are about the specific distinction of many forms which we now look on as good species."

This is as true now as when it was written nearly thirty years ago, so it has therefore been a great advantage to have the additional test of the genitalia to apply before attempt-

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ing to decide many difficult points of this character. We have found that in most cases when one knows them well enough they confirm the ideas we had arrived at from other considerations, and only exceptionally do difficulties arise as to the relationship of the species.

With regard to the question of nomenclature I adhere to the views that I have often expressed, which are: that as it is in many cases impossible to be absolutely certain about the species described by old authors, who often, indeed I may say usually, were most imperfectly acquainted with the species they attempted to describe, it is far better to use a name which has been generally accepted and adopted by modern naturalists and writers, than to try to apply too strictly the laws of priority. Since I last wrote, the trinomial system, which has been adopted by many ornithologists, has been introduced by Mr. Rothschild in his revision of the Eastern Papilionidæ. It is no doubt necessary to have some lower grade of definition than what I consider specific, and the number of named varieties which have been described, but which are seldom capable of exact definition, has among the Palearctic Lepidoptera assumed alarming proportions; but if in such a case, as for instance, *E. alecto*, Hübn., or *E. cæcilia*, Hübn., we adopt the trinomial system, we lose sight of the facts which have been so clearly pointed out by Staudinger on p. xxiii. of the introduction to his Catalogue, that there are several kinds of varieties, namely, local varieties, more or less constant, which he defines by the prefix of "*var.*"; accidental varieties or aberrations, which he defines by the prefix of "*ab.*"; and seasonal varieties or generations which he defines by the prefix of "*gen.* i." or "*gen.* ii." as the case may be. Now if I write *E. glacialis alecto*, Hübn., I obscure the true facts, because Hübner was not the author of *glacialis*, and his *alecto* is in some districts of the Alps a local variety, and in others according to Calberla an aberration only. *E. manto* var. *cæcilia*, Hübn., which in the Alps is a rare aberration, in the Pyrenees is a constant variety, and if I could be sure that the typical *manto* did not also occur in the Pyrenees, I would treat it as a good species and give it a new name, as I have never seen an Alpine specimen which is exactly like it.

Therefore however suitable and justifiable the trinomial plan may be in ornithology, I do not think it is applicable

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to Lepidoptera, but am of opinion that to carry the naming of varieties to the point which many continental writers have done, is not justifiable. The larger the number of specimens which are brought together from many localities the more difficult it becomes to recognise these varieties, and I have therefore dropped the names of a few which I had previously adopted, though I have not done so in cases where, as with many of the Asiatic forms, my knowledge is as yet insufficient to justify this course.

As however I do not expect every one to take the same views as myself, I have in arranging the British Museum series placed the varietal name on one side of all those specimens which seem to belong to them, so that every one may be able to judge for themselves whether to retain or to drop the varietal name.

I have added a table giving the geographical distribution of the genus so far as known, which shows among other things that there are apparently 3 great centres of distribution. The first is the Alps of Europe, which is undoubtedly the metropolis of the genus, no less than 26 species being found here, of which 22 occur in the Western, 22 in the Central, and 19 or 20 in the Eastern Alps, many of them being peculiar. Of these 13 or 14 extend their range to the Pyrenees, which in addition have developed 2 peculiar species, *E. lefebvrei*, and *E. gorgone*. Spain has one, namely, *E. zapateri*, and a well marked loca variety of *E. tyndarus*. The Apennines have as many as 11 or 12 Erebias, but no peculiar species or local varieties. The Carpathians also have 12 or 13, none of which is peculiar. In the mountains of the Balkan peninsula, of which however we know but little, there are only 6, of which none is peculiar; but one, a variety of *E. afra*, is found on the coast of Dalmatia completely isolated from all its nearest allies, which are Asiatic.

In the Caucasus and Armenia we know only 6 species, of which *E. hewitsoni* alone is peculiar and that a low country and not an alpine species. Considering the great extent and isolation of this high mountain range which seems admirably suited to the habits of the genus, it is a most remarkable fact that not a single endemic alpine form has been developed therein. In Scandinavia and North Russia 5 species only occur of which *E. disa* alone is peculiar, though a form of it is found in Siberia and another in the Rocky Mountains of British N. Ameria.

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In the Ural again we have but 5 species, one or two of which are Asiatic, whereas several European ones which occur in the Altai mountains are unknown. But when we come to the great mountain ranges of Turkestan and Southern Siberia, we at once meet with a number of new forms, most of which are by their outward appearance, as well as by their clasp-forms, distantly related to the species of the European Alps.

In the Western Altai, from the little we know, the majority of the Lepidoptera appear to be of European character; but southwards in the great Thianshan range and in Turkestan, especially in the Pamir and Hindu-kush ranges, we have a group which seems more nearly allied to the Himalayan and Chinese genus *Callerebia*, some of which have been separated by Moore under the generic name of *Paralasa*. I am not yet prepared to say how far generic division can be properly carried, but if *Paralasa* proves, as I anticipate, to be a good genus we shall probably have to include in it not only *mani* with its forms *jordana* and *roxane*, but also *E. parmenio*, *myops*, *maracandica*, *radians*, *kalmuka*, *hades*, and *tristis*, all of which have a differently formed hindwing and a venation differing slightly from the European Erebias. One may say that the European species as a rule form a very homogeneous genus but that the Asiatic ones do not; and if the subdivision of the genus is commenced, I believe that logically we should have to separate some other Asiatic and American species which I have now included. In the mountains of Transbaikalia and in the mountains which divide Central Siberia from Mongolia, at present very little explored, we seem to have a third centre of distribution, no less than 18 species being known to occur therein. Some of these, such as *E. kefersteini*, *medusa*, *ligea* and *tyndarus*, are European or very nearly allied to European forms, others, such as *E. parmenio*, *cyclopius*, *dabanensis* and *theano* with its forms, are typically Asiatic; and some, such as *E. rossi*, *edda*, and *erinna*, are Arctic and N.-W. American in their affinity, so far as I can judge from the very slight knowledge of them which I possess. In Tibet we have but one species, *E. alcmene*, which is of European type, the few others which occur there being Callerebias; and in Japan only *E. sedakovi*, which is also found in Amurland.

This shows that the genus *Erebia* is characteristic of the

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Western Palearctic region only, the Eastern species being nearly all aberrant.

In America we have in all 8 species, of which 6 are found in the Rocky Mountains. Of these *E. tyndarus* is inseparable from the European species even as a variety. *E. epipsodea* has a remarkable resemblance to the northern form of *medusa*; *E. disa* var. *mancinus* is hardly distinguishable from the Lapland insect. *E. vidleri* is so like *sedakovi* that I separate it with some doubt. *E. discoidalis* is common to Arctic America and Asia, *E. sofia* is but a variety of the Siberian *maurisius*, and *E. magdalena*, which we only know from a very restricted area in the highest mountains of Colorado, is peculiar. In Arctic America we know four species at present of which *E. rossi* and *E. discoidalis* also occur in Asia and *E. fasciata* is peculiar.

There is not a single species in Eastern America and though one or two Erebia-like insects have been discovered in Patagonia, there is in this genus nothing analogous with what we find in *Colias* and *Argynnis*, where outlying, more or less aberrant species are found in spots suitable to their habits in the Andes and Antarctic America.

Synopsis of the Genus Erebia.

1. EPIPHRON, Knoch., Beitr., iii, p. 131, t. 6 (1783); H.-S., 92–94	Harz, Silesia, Black Forest, Vosges.
var. *pyrenaica*, H.-S., 535–38. . . . (*inconstans, nom. vix conservandum; trans. ad* cassiopem).	Pyrenees.
var. *cassiope*, Fabr., Mant., p. 42 (1787); Meyer-Dür, t. ii, 4, 5, 7 . . . (*inconstans—formæ intermediæ adsunt.*)	Alps, Pyrenees, Hung. mont., Scotland.
ab. *nelamus*, Bdv., Gen., p. 26 (1840); Meyer-Dür, t. ii, 3 . . . . . (ab. *vix fasciata et fere inocellata.*)	Alps.
2. MELAMPUS, Fuessly, Verz. Schw. Ins. p. 31, fig. 6 (1775); Esp., 103, 1. . . .	Alps, Switz., Hung., Ital.
var. *sudetica*, Stgr., Cat., p. 10 (1861) . . (var. *supra et subtus mac. ruf. majoribus.*)	Silesia mont.

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3. KEFERSTEINI, Ev., Bull. Mosc. 1851, ii, p. 610; H.-S., 617–18	Sib. cent. mont.
4. FLAVOFASCIATA, Heyne, Ruhl. Pal. Gross-schmett., p. 805 (1895)	Alps of Ticino.
5. ERIPHYLE. Frey., ii, p. 150, t. 187, 3, 4 (1836); Meyer-Dür, p. 154, t. ii, 8; *cf.* Roth. Mitt. Schw. ent. Ges., i, p. 110 (1863); Christ, *l.c.*, vi, p. 231 (1882)	Helv. mont.
? var. *tristis.*, H.-S., 387–90 (*? forma orientalis*).	Alp. Tyr. et Austr.
6. ARETE, Fabr., Mant., 42 (1787): Hübn., 231–32	Austr. Alp.
7. CHRISTI, Rätzer, Mitt. Schw. ent. Ges., viii, p. 220 (1890); Schulz, Stett. ent. Zeit., liii, p. 359 (1892)	Laguinthal *prope* Simplon.
(*sp. mihi dubia an* mnestræ *var. vel ab.* ?)	
8. MNESTRA, Hübn., 540–43 (1802); Esp., 120, 3, 4 (*post* 1802.)	Alp. Helv. et Gal.
9. PHARTE, Hübn., 491–94 (1802 ?) . . .	Alp. Switz., Austr.
ab. vel var. *phartma*, Stgr., Iris, vii, p. 245 (*inocellata*)	Valais Alps.
10. MAURISIUS, Esp., 113, 4, 5; Forts., p. 106 (1802 ?) *kindermanni*, Stgr., Stett. ent. Zeit., 1881, p. 269	Altai.
var. ? *stubbendorfii*, Mén., Bull. Acad. Petr., v, p. 262 (1847)	Altai.
var. ? *pawlowskyi*, Mén., Bull. Phys. Math., xvii, p. 217; En. iii, p. 145 . . .	Mts. of Dahuria and prov. Irkutsk.
herzi, Christoph, Hor. Ent. Ross., xxiii, p. 2 (*fide* Alphéraky); Stgr., Iris., vii, p. 244 (1894)	
(*minus distincte notata supra cellam fusca, inconstans* ?)	
var. ? *haberhaueri*, Stgr., Stett. ent. Zeit., 1881.	Tarbagatai, Alatau mont.
var. ? vel bona sp. ? *sofia*, Streck., Bull. Brookl. Ent. Soc., 1881, p. 35	Fort Churchill Hudson Bay.
ethela, W. H. Edw., Can. Ent., xxiii, p. 31 (1891)	Yellowstone Park, U.S.A., 7—8,000 feet.

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11. THEANO, Tausch., Mém. Mosc., i, p. 207, t. 13. 1 (1809)	Sib. centr., Altai.
12. MANTO, Esp., 70, 2, 3 (1781), ii, p. 106, t. 120, 1	Alps, Pyrenees, Hung. mont.
ab. *cæcilia*, Hübn., 213–14, Text p. 35 . . (*supra fere vel rarius tota nigra.*)	Alps.
var. constans *cæcilia*, Dup., i., 49, 6, 7 . . (♂ *et* ♀ *supra tota nigra*, ♀ *infra minus fusca notata.*)	Pyrenees.
var. et ab. *pyrrhula* Frey, Lep. Schweiz, p. 37 (1880) . . . . . (var. *minor alpestris*)	Albula Pass, Tyrol, 5—7,000 feet.
ab. ♀ *trajanus*, Horzumaki, Schmett. Buk., p. 36, *ex* Verh. k. k. Zool. Bot. Ges. (1897) . (*non vidi.*)	Carp. mont.
13. CETO, Hübn., 578–9 (1803)	Alps, Hung. Gall. mont.
14. MEDUSA, Fabr., Mant., p. 40 (1787); Hübn., t. 45, 103–4	Germ. cent. et mer., Belg., Gal. or., Helv. ad 4,000 ped., Græcia, Cauc.
var. et ab. *psodea*, Hübn., 497–99, p. 34 . . (*inconstans ocellis pluribus majoribus*)	
ab. *procopiani*, Horzumaki, l. c., p. 36 (*non vidi*)	Carp. mont.
var. *hippomedusa*, Ochs., Meiss. N. Anz. Schw., Nr. 12, p. 15; Meyer-Dür, p. 163 . (var. *alpestris inconstans minor ocellis paucioribus minusve conspicuis*, ? *ad* œmen *referenda.*)	Austr. et Helv. Alp. 3,700—6,000 ped. *fide* Meyer-Dür.
var. vel bona sp. ? *polaris*, Stgr., Cat., p. 10 (1861) . . . . . (*subtus subfasciata, trans. ad sequentem.*)	Lapp., Norv. bor., Sib. centr. et ? bor.
var. *uralensis*, Stgr., Cat., p. 10 (1861) . .	Ural mont.
15. OEME, Hübn., 530–33 (1803); Esp., 120, 2 .	Alp, Gal. mont., Pyr.
var. *spodia*, Stgr., Cat., 1871, p. 24 . . . (var. *major ocellis majoribus.*)	Austr. et Styr. mont. et Alp.
16. EPIPSODEA, Butl., Cat. Sat. B. M., p. 80, t. 2, fig. 9 (1868); Edw., Butt, N. A., iii, Erebia, iii..	Colorado, Montana, Prov. Alberta mont. et Alp, 2—10,000 ft

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var. vel ab. *brucei*, Elw., Trans. Ent. Soc. Lond., 1889, p. 326; Edw. *l. c.* . . . . . (var. *minor ocellata.*)	Summit county, Col., 12,000 ft.
17. MELAS, Herbst, 210, 4–7, viii, p. 191 (1796) .	Hung. mer. mont.
maurus, Esp., 107, 3, 4 (1798 ?) . . .	Græcia mer. mont., ? Dalm.
18. LEFEBVREI, Dup. t. xxxv, 3, 4, ♂; ? Bdv. Ind., p. 23 (1829)	Pyr. cent., 6—8,000 ft.
var. *pyrenæa*, Ob. Et. Ent., viii, p. 22; Godt., ii, t. xvii, 1, 2, ♂ . . . . . (*minor minus ocellata.*)	Pyr. or., 7—9,000 ft.
var. ? *astur*, Ob. l. c., p. 22, t. 1, 12, ♀ . .	Asturias mont., 6—8,000 ft.
19. STYGNE, Ochs, i, 1,276 (1807); H.-S., 90, 91, ♀	Germ. mer. et Gal. mer. mont., Pyr., Cauc. (*non vidi*).
ab. vel var. ? *valesiaca*, ♂ *fere vel tota nigra vix fasciata* ♂ *et* ♀ *minus ocellata* . .	Valais Alp.
20. NERINE, Freyer, 13, 3, 4 (1831); Stgr., Iris., viii, p. 285	Helv. mer. or. et Tyrol. mer. mont., 1—5,000 ped.
var. *reichlini*, H.-S.; *cf.* Stgr., *l. c.* . . (*obscurior minus fasciata subt. al. post. inocellata.*)	Austr. mont. (Salzburg).
var. inconstans et ? ab. *morula*, Speyer, Stett. ent. Zeit., 1865, p. 248 . . . . (var. ? *alpestris minor, obscurior, subtus unicolor.*)	Tyrol. mer. Alp.
21. SCIPIO, Bdv. Ic., 30, 1–6, i, p. 152 (1832) .	Gall. Alp. mer. or. (Briançon, Digne).
22. GLACIALIS, Esp., 116, 2 (ante 1800 ?); H.-S., 173–74	Helv. et Austr. et Ital. Alp.
pluto, Esp., 121, 1; *cf.* Calberla, Iris, ix, pp. 375–93, t. viii.	
var. et ab. *alecto*, Hübn., 528–29, 5 (*nec* 515–16) *melas-nicholli*, Ob., Ent. Mo. Mag., Jan. 1896.	Tyrol. Alp. etc

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23. EVIAS, Godt., Tabl., Méth., p. 21 (1822) ; Bdv. Ic., 31, 3–5 . . . . . *bonelli*, Hübn., 892–95.	Valais, Ped., et Gall. mont., Pyr., Hisp. centr. mont.
24. HEWITSONI, Led., Wien. Mon., 1864, p. 167, t. 3, 6, 7 ; Stgr., Hor. Ent., 1870, p. 65 . .	Georgia, Suanetia, Persia bor. mont.
25. TYNDARUS, Esp., 67, 1 (1781) ; *cf.* Ob. Et. Ent., viii, p. 25	Helv., Austr., Pyr., It., Gall. et Hung. alp.
callias, W. H. Edw., Trans. Am. Ent. Soc., iii, p. 274 (1871)	Colorado alp.
ab. *cœcodromus*, Gn. et Vill., p. 87. (*absque ocellis.*)	
var. *dromus*, H.-S., 168–69, 275, vi, p. 8 ; Ob. Et. Ent., viii, p. 25 . . . . . (*inconstans, cum trans. ad* tyndarum *et* hispanicam, *fasciis fulvis, ocellis majoribus.*)	Pyr. Cauc., It. mont., Arm.
var. ? *iranica*, Gr.-Gr., Hor. Ent. Ross., xxiv, p. 291 (*non vidi*)	Pers. bor. alp. (Demavend).
var. *hispania* (rect. *hispanica*), Butl. Cat., 86, t. ii. . . . . (*major, ocellis maximis, subt. unicolor.*)	And. mont. alp.
var. *ottomana*, H.-S., 376, 379–80, vi, p. 8 ; Stgr., Hor. Ross. Ent., 1870, p. 67 . .	Græcia. mer. mont., Bith. mont., Arm. mont.
var. *sibirica*, Stgr., Stett. ent. Zeit., 1881, p. 270 . . . . . (*trans ad.* dromum, *nom. vix conservandum.*)	Tarbagatai mont, Dahuria mont.
26. GORGE, Esp., 119, 4, 5 (ante 1800 ?) ; Hübn., 50, 2–5	Sum. alp. Pyr., Hisp. bor. alp.
var. *triopes*, Speyer, Stett. ent. Zeit., 1865, p. 248 . . . . . (*al. ant. ocellis* 3 *apicalibus.*) . . .	Sum. alp. (*cum forma typ. mixta*).
var. et ab. *erynis*, Esp., 121, 3 (*absque ocellis*) .	Sum. alp. (Mont Cenis).

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27. GORGONE, Bdv. Ic., 29, 5–8, i, p. 150; H.-S., 75, 76, 469–70 . . . . . (*sp. dist. secut genitalia*, ♀ *subt. venis albicantibus.*)	Pyr. cent. alp. (Gavarnie).
28. GOANTE, Esp., 116, 1 (ante 1800 ?); H.-S., 77–79	Alp., Carp. mont.
29. PRONOE, Esp., 54, 1 (1780); Hübn., 215—17 .	Alp., Austr. Alp., Carp., Bith. mont., Pyr.
var. *pitho*, Hübn., 574–77 . . . . (*inconstans, obscurior, fasciis et ocellis subnullis.*)	Alp., Helv., Tyrol.
30. ÆTHIOPS, Esp., 25, 1 ♂ (1777), 63, 1, ♀. *medea*, Hübn., 220–22; *blandina*, Fabr., Ent. Syst., p. 236 (1793)	Eur. centr., Angl. sept., Turc., Bith.,
? var. *melancholica*, H.-S., 276–79, vi, p. 10 .	Cauc. Arm. Ross. mer., Altai, Ararat.
var. ? *æthiopella*, Stgr., Iris, x, p. 324 (*non vidi*)	Kentei mont. (Mongolia).
31. SEDAKOVI, Ev., Bull. Mosc., 1847, iii, 70, t. i, 5, 6; H.-S., 591–92 . . . . . *niphonica*, Jans., Cist. Ent., ii, p. 153, t. v, 5 (1877).	Sib. or Japan.
var. ? vel bona sp. *alcmena*, Gr.-Gr., Hor. Ent. Ross, xxv, p. 457 (1891); Leech, Butt. China, p. 99, t. ix, 10, ♂	Tibet or.
32. VIDLERI, Elw. (sp. nov., sedakovi *proxima secut genitalia distinguenda*) . . .	Columbia Brit.
33. NEORIDAS, Bdv., Ind., p. 23, Ic., 29, 1–4 . . ab. ? *margarita*, Ob., Feuille Jeunes Nat., No. 306 (1. 4. 96); Et. Ent, xx, p. 37, t. ix, 155, ♂. (*natura non vidi, secut descr. haud distinguenda.*)	Gal. mer. mont. Pyr.
34. ZAPATERI, Ob., Ann. Soc. Ent. Esp., iv, p. 370, t. 17, 1, 2 (1875)	Cat. Aragon mont.

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35. LIGEA, Linn., Syst. Nat., ed. x, 473; Hübn., 225–8	Eur. centr. et sept., It. mont., Balk. pen., Ural, Sib. occ. centr. et or., Kamschatka,
ajanensis, Mén., En., ii, p. 104 (1855).	
eumonia, Mén., Schrenk's Reise, p. 34, t. iii, 4	
ab. ? et var, *adyte*, Hübn., 759–60; *cf* Schilde, Stett. ent. Zeit., 1873, p. 179 . . .	Norv. bor. Dovrefjeld, Fen. Alp. ?
(var. *minor*, *alpestris*, *inconstans*, ? *trans. in part ad* euryalem.)	
var. *livonica*, Teich., Stett. ent. Zeit., 1866, p. 133	Liv., Mt. Oesel. Fen.
(*inconstans*, ♂ *al. post. subt. unicoloribus.*)	
36. EURYALE, Esp., 118, 2, 3; Hübn., 789–90; *cf.* Meyer-Dür, p. 177	Alp., Pyr., Sil. Hung., It. mont., Dahuria.
(*bona sp. in part. secut genitalia distinguenda.*)	
var. *euryaloides*, Tengstr., Cat., p. 11. . .	Fen., Ross. bor., Sib. bor. ad 68° N.
jeniseiensis, Trybom, Ofver. Vet. Akad. Forh., 1877, p. 46.	
(var. *inconstans*, *ocellis subnullis*, ? *trans ad* ligeam *in part.*)	
var. *ocellaris*, Stgr., Cat., p. 11 . . .	Tyrol, Styr. et Car. Alp.
(*inconstans*, ♂ *supra mac.* (*non fasciis*) *rufis* ♀ *al. post. subt. grisescentibus.*)	
37. META, Stgr., Stett. ent. Zeit, 1886, p. 237 .	Prov. Namagan mont.
gertha, Stgr., *l. c.* (var. *inconstans fasc. majus distinctis.*)	
mopsos, Stgr., *l. c.*, p. 239 (var. ? *major minus ocellata et fasciata*)	Prov. Samarkand, Kuldja.
alexandra, Stgr., *l. c.*, 1887, p. 55 . . .	Alexander mts., Turkestan or.
issyka, Stgr., *l. c.*	Issykut, Turkestan.
var. ? *melanops*, Christ., Hor., Ent. Ross., xxiii, p. 299	Prov. Samarkand.
38. LAPPONA, Esp., 108, 3 (1798 ?) . . .	Alp., Carp., Scand., Balk. mont., Lap. Altai ?

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var. *sthennyo*, Grasl., Ann. Soc. Fr., 1850, t. 10, 1–3	Pyr. centr.
(*inconstans, fasc. supra et subtus obsoletis vel indistinctis.*)	
39. OCNUS, Ev., Bull. Mosc., 1843, iii, 538, t. 8, 5, a, b ; H.-S., 291–92	Sib. mer. alp., Alatau mont.
40. SIBO, Alph., Lep. Kuldja (*ex* Hor. Ross. Ent., 1881) p. 83, t. xv, 20, ♂, 21, ♀ ; ? var. vel bona sp.	Kuldja prov. alp. Thian-shan, Transili alp.
mongolica, Ersch., Hor. Ent. Ross., xxii, p. 199, t. ix, fig. 3, ♂ (1888) ; Gr.-Gr., Rom. Mém., iv, p. 452, t. xiv, 3, ♂ (1890).	
41. DABANENSIS, Ersch., Hor. Ent. Ross., viii, p. 315 (1872) ; Rom. Mém., ii, t. xvi, 1, ♂ .	Dahuria mont.
? var. *tundra*, Stgr., Rom. Mém., iii, p. 148, t. viii, 1, ♀ (1888)	Sayansk mont.
42. TURANICA, Ersch., Hor. Ent. Ross., xii, p. 336 (1876) ; Alph., *l. c.* (in sep.) t. xv, 22 .	Alatau, Namagan, Thian-shan mont., 3 — 10,000 ped. alt.
var. *læta*, Stgr., Stett. ent. Zeit., 1881, p. 275.	
? var. *tristis*, Gr.-Gr., Hor. Ent. Ross., xxvii, p. 383 (*non vidi*).	
43. EMBLA, Thunb., Diss. Ent., 11 (Dec. 1791), p. 38, t. f. 8, 8	Scand. centr. et bor., Ross. sept., Sib. bor. ad 70° N. Amur sup. et inf.
var. *succulenta*, Alph., Rom. Mém., ix, p. 325, (1897)	Kamschatka, Arga (Mongolia).
lama, Stgr., MSS. ?	
(var. *dilutior* ? *distincte ocellata* ? *nomen conservandum.*)	
embla, var. vel. transitus ad *disam* ? . .	Prov. Irkutsk. ad fluv. Vilni, Vitim et Oudim.
embla-disa, Mén., *cf.* Mén., Cat. Lep. Mus. Petr., p. 105 ; Mén., Lep. Sib. or., Schrenck's Reise, p. 358 ; Mén., Bull. Phys. Acad. Petr., 1859, p. 218.	
44. DISA, Thunb., *l. c.*, p. 37 ; Freyer, 416, 1, 2 .	Lap. Norv. bor. : Karelia.
griela, Hübn., 228–9.	

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var. *mancinus*, Doubl. Hew., Gen. Di. Lep., ii, p. 380, Atlas, t. 54 (1850–52) . . . (*al. ant. supra disc. rufescentibus al. post. subt. minus fasciatis.*)	Prov. Alberta, Brit. Columbia.
45. ROSSI, Curt., App. Ross. Voy., p. 67, t. A, 7 (1835); Aurivillius, Ins. Vega Exp., iv, p. 75, t. 1, 4 (1885) . . . . . var. vel. syn. ? *ero*, Brem., Lep. Ost. Sib., p. 20, t. 11, 1.	Boothia Felix, Am. Arct. 67° — 68° N., Hudson Bay, St. Lawrence Bay, N. E. Asia, Apfel Gebirge (Amur sup.), Sayansk mts. Dahuria, Yenesei, 78° N. (Trybom).
46. EDDA, Mén., Midd. Reise, p. 58, t. iii, 11 (1851); Graeser, Berl. ent. Zeitschr, 1888, p. 96 .	Sib. or. bor. (Prov. Irkutsk, Yenesei flum. ad 65° N.)
47. CYCLOPIUS, Ev., Bull. Mosc., 1844, iii, 590, t. xiv, 3, a, b; H.-S., 607–8 . . .	Ural mont., Sib. centr. et or.
48. TRISTIS, Brem., Bull. Acad., 1861, t. iii . . *wanga*, Brem., Lep. Ost. Sib., p. 20, t. ii, 1.	Amur (Burcija).
? var. *saxicola*, Ob., Et. Ent., ii, p. 32, t. iv, 1 (1876) (*non vidi*)	Mongolia (Ourato).
49. DISCOIDALIS, Kirby, Faun. Bor. Am., iv, p. 298, t. iii, 2, 3; Graeser, Berl. ent. Zeitschr., 1888, p. 96 . . . . . *lena*, Christoph, Hor. Ent. Ross., xxiii, p. 299, (*fide* Alphéraky, *non vidi*).	Am. bor. Hudson Bay, Canada occ., Prov. Alberta, Amur. sup., Sib. or. et bor. ad 70° N.
50. EPISTYGNE, Hübn., Verz., p. 62 (1816); Hübn., 855-58	Gall. mer. or. mont.

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51. AFRA, Esp., 83, 4, 5 (1783)	Ross.mer., Altai mont., Tarbagatai mont., Cauc. mer. mont.
var. *dalmata*, Godt., Enc. Méth., p. 530 . (*major?, subtus majis unicolor, venis minus albicantibus.*)	Dalmatia (*prope* Zara), Askabad, Persia sept. (*fide* Christoph, *non vidi*).

Subgenus distinctum ?

52. FASCIATA. Butl., Cat. Sat. B. Mus., p. 92, t. 2, 8 (1868)	Amer. arct. (WinterCove, Cambridge Bay) voy. Collinson.
53. MAGDALENA, Streck., Bull. Brook. Ent. Soc., iii, p. 35 (1880) ; Edw., Butt. N. Am. iii, pt. v ; Ereb. i, 1–4 (1888)	Colorado alp., 12 — 14,000 ped. alt.
54. ERYNNIS (recte *erinna*), Stgr., Iris, vii, p. 247, t. ix, 2, ♀ (1894)	Sayansk or. mont. Sib.

Genus ? novum distinctum ad PARALASAM vel CALLEREBIAM majus affine.

1. PARMENIO, Boeb., Nouv. Mém. Mosc., ii, p. 306, t. 19 ; H.-S., 421–22, 464–66 . . .	Sib. cent. et or.
2. MYOPS, Stgr., Stett. ent. Zeit., 1881, p. 296 .	Alatau mont., Persia sept.
3. MARACANDICA, Ersch., Lep. Turk., p. 17, t. 1, 13 (1874)	Pamir, Alai mer.
4. RADIANS, Stgr., Stett. ent. Zeit., 1886, p. 240 .	Kuldja mont., prov. Ferghana mont.
5. KALMUKA, Alph., Lep. Kuldja (Hor. Ent. Ross., 1881), p. 81, t. 18, ♂, 19, ♀ . . .	Thianshan mont.
6. HADES, Stgr., Berl. ent. Zeitschr., 1882, p. 172 .	Alai, Pamir mont.

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7. HERSE, Gr.-Gr., Hor. Ent. Ross., xxv, p. 457 (1891); Leech, Butt. China, p. 99, t. ix, 7, ♀, 8, ♂	Tibet or., Sinin mont.

Genus PARALASA, Moore, Butt. Ind.

1. MANI, de Nicév., Journ. As. Soc. Beng., xlix, 2, p. 247 (1880); Butt. Ind., 1, p. 242, t. xv, 43, ♂	Prov. Ladak.
jordana, Stgr., Berl. ent. Zeitschr., 1882, p. 171	Prov. Khokand mont.
var. ? *roxane*, Gr.-Gr., Rom. Mém., iii, p. 401, (1888) . . . . . (*al. post. supra rufo-fasciatis, subtus punctis albis subnullis*)	Alai Pamir mont.
2. KALINDA, Moore, P.Z.S., 1865, p. 301, t. xxx, 5, ♀; Marsh. & de Nicév., Butt. Ind., p. 241	Him. occ. 9—13,000 ped. alt.
3. SHALLADA, Lang, J. As. Soc. Beng., xlix, 2, p. 247 (1880); Marsh. & de Nicév., *l. c.*, t. xv, 42, ♂	Him. occ., 6—8,000 ped. alt.

The group of small Erebias, which are mostly peculiar to the Alps of Europe, and some of which are rather local, have been separated generically under the name of *Oreina*, Westw.; but I can find no character which justifies their separation from Erebia, and even if there were, the name is preoccupied. Though several of the species occur abundantly together on the same ground, fly at the same time, and have similar habits, I have no reason to believe that hybrids occur; and though abnormal varieties of *E. epiphron*, *melampus*, *eriphyle*, *pharte*, *manto*, are often difficult to identify without a good series and an intimate knowledge of their variations, yet they can be separated without having recourse to the genitalia, when one knows them well enough. I have nothing to add to what I wrote of the varieties of *E. epiphron* and *E. melampus*; but *E. eriphyle*, which I formerly thought a doubtful species, seems, now that I know it better from the fine series kindly given me by Dr. Chapman, to be distinct.

In the Central Alps it is rare or local, the variety described by Freyer, which occurs at Davos, and occa-

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sionally in other parts of Switzerland, being less distinctly marked than those from Tyrol and Carinthia, where in certain places it is very abundant. On the San and Kur Alps near Stetzing it seems to be very numerous, and flies in company with *E. pharte* (which it often very closely resembles), *cassiope*, and *melampus*. I have taken it myself only in the Lechthal, near the Arlberg pass, and failed to recognise it at the time. Dr. Chapman found it at San Anton, on the east side of that pass, the specimens from these places being intermediate between those from Switzerland and Carinthia.

It may be recognised on the upperside by the shape, and especially by the position, of the fulvous markings of the hindwing; these are normally four in number, of which in Swiss specimens the two hindermost are usually faint or absent, and in Carinthian examples usually distinct. These marks are not placed in a regular line parallel to the outer margin, as in *E. pharte*, *melampus*, and *cassiope* but in pairs, of which the upper two are close together, and the second, always the most conspicuous, and the last to disappear, is more or less elongated towards the base of the wing. The band of the forewing has usually two (in the females and in both sexes from Carinthia sometimes three or four) black spots, which are very rare in *E. pharte* (I have only two females which show any trace of them). On the underside the male has the base of the forewing more suffused with rufous and the band of the forewing not so well defined. On the hindwing in the females and Carinthian males there is sometimes a fifth spot nearer the costa, in which case the elongated spot is the middle one. The colour of the hindwing in the female is more chocolate, and less grey than in *E. pharte*. From *E. melampus* it may be known by the absence of black eyes in the fulvous spots of the underside of the hindwing. There are occasionally small male specimens of *E. manto* var. *pyrrhula*, which are hard to distinguish from Swiss specimens of *E. eriphyle*, and these as well as abnormal *melampus* often stand for it in collections; but, by using glass-bottomed drawers, which enable the whole series of undersides to be seen at once, the difference, however slight, can be appreciated, and though the females of *eriphyle*, *pharte*, and *melampus* are close, that sex of *E. manto* in all its varieties is easily distinguished by the pale base of the hindwing below.

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Erebia kefersteini.

This is an eastern form, of which I knew little nine years ago, but I have now received specimens from the Chamar Daban Mountains near Lake Baikal, where it seems abundant. It is nearest to *E. melampus*, from which it can usually (perhaps not always) be distinguished by the inner area of the forewing being more or less tinged with red-brown and the band on the inside being less well defined. The difference in the genitalia is however enough to decide on in doubtful cases.

Erebia flavofasciata, Heyne.

It seems almost incredible that a new species of *Erebia* so distinct in appearance as this should be discovered in a part of the Alps which must have been often visited by collectors, but such is the case. It was found by Lieut.-Col. von Nolte on July 8, 1893, on the Campolungo pass between Fusio on the upper part of Val Maggia, and Faido on the Val Levantina in the Canton Ticino at about 7,500 feet elevation.

It flies on the east side of the pass, on grassy slopes among rocks, in company with *E. cassiope* and *gorge*, and apparently comes out about the end of June, as some of the males were much worn on July 8. It is distinguished from *E. melampus*, to which it apparently comes nearest, and from all other species by a well-defined yellowish band on the underside of the hindwing, in which five dark spots appear. On the forewing below there are four similar spots, placed in a narrower darker band, which towards the hindwing becomes merged in the ground colour of the wing. On the upper side the bands are nearly or quite obsolete, well marked only towards the apex of the forewing. The spots above are in some specimens more or less obsolete, especially on the hindwing.

The female, which I have not seen, is said to resemble the male.

Dr. Chapman informs me that there are two specimens of this species in Mr. Nicholson's collection, which were taken by his father somewhere in the Upper Engadine, and there is little doubt that the species is not so restricted in its habitat as it now seems to be.

The genitalia are distinct from those of *E. melampus* or any other species.

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Erebia christi.

Rätzer, MT. Schweitz. ent. Ges. viii, p. 220, 1890, ♂.
Schulz, Stett. ent. Zeit. liii, p. 359, 1892, ♀.

The position of this newly discovered species is at present a little doubtful. It looks so near to some specimens of *E. mnestra* that I should have been doubtful as to its specific distinction if it were not for the genitalia, which show it to be different from all European species; while its occurrence in quantity proves that it cannot be a hybrid between *E. cassiope* and *mnestra*, of which it seems to combine the characters.

Schulz, who first described the female, says that *E. mnestra* occurs in great numbers in the same place where he found *E. christi*, and after discussing carefully the opinions of Dr. Christ, of Rätzer, and of Dr. Staudinger, which he quotes, he comes to the conclusion that the species is more nearly allied to *cassiope* than to *mnestra*, though it averages from a half to a quarter larger in size than *E. cassiope*.

The only locality in which *christi* has been taken, so far as I know, is the Laguinthal near the village of Simpeln or Simplon on the pass of that name, where it flies during the first half of July on steep slopes covered with a rich Alpine vegetation between steep cliffs and stone shoots.

Erebia maurisius, *E. kindermanni*, *E. haberhaueri* and probably *E. pawlowskyi* and *E. stubbendorfi* form a group which comes nearest to *E. pharte*, and has a wide range all through the mountains of Central Siberia. Whether they can be distinguished as separate species seems very doubtful, and the synonymy is difficult, because it is not easy to say from Esper's figure which of the forms he knew. That however which has been identified with this figure by continental entomologists is found in the Altai and mountains south and west of Irkutsk, and has a well-marked chocolate patch in the cell of the forewing above and a well-marked series of elongate brown spots on the hindwing below, which often shows a much paler central streak.

E. kindermanni, Stgr., may or may not be the same as this. It was described from a single pair from the Altai in Lederer's collection at a time when Dr. Staudinger says he did not know *E. maurisius*. No one has since discriminated between the two, so far as I know.

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E. stubbendorfi, Mén., or what has been identified with this by Staudinger, is like *maurisius* but with little or no chocolate in the cell; the band of yellowish patches on the forewing is therefore more defined on the underside and on the hindwing variable or even absent.

E. haberhaueri was taken in the Tarbagatai mountains which are connected with the Altai range, and differs in having the chocolate cell less defined and in the smaller and rounder spots of the hindwing below, which in one of my specimens are almost obsolete.

E. pawlowskyi from the mountains near Urga and of Irkutsk, has no chocolate in the cell above, and the band of spots on both wings much reduced. On the underside however the series on both wings is more conspicuous and much paler in colour (in the ♀ almost white), but there is considerable variation in the size, number and colour.

Dr. Chapman can find no characters in the clasps of any of these by which they can be distinguished *inter se*.

In the Yellowstone Park of North America and also on the west coast of Hudson's Bay has been found an Erebia, which Strecker described as *sofia* and considered almost the same as *haberhaueri*, and which was afterwards named *ethela* by Edwards. I have three males and two females from the Yellowstone which have most resemblance to the male of *E. haberhaueri* and the female of *E. pawlowskyi*. All five however have a more or less defined pale patch in the cell of the hindwing below, of which only a faint trace can be seen in two or three of my 20 Asiatic specimens, and by this patch I am at present able to distinguish any American from any Asiatic specimen I have seen.

The nomenclature might therefore best stand as follows:

E. maurisius, Esp.	Mountains of Central Siberia from Altai to Dahuria.
= *kindermanni*, Stgr.	
var. ? *haberhaueri*, Stgr.	
var. ? *stubbendorfi*, Mén.	
var. *pawlowskyi*, Mén.	
var. vel bona sp. *sofia*, Streck. . . .	Fort Churchill, Hudson's Bay; U.S.A., Yellowstone Park, Montana, about 8,000 ft.
= *ethela*, W. H. Edw.	

Erebia theano.

This species, though apparently belonging to the same group as *maurisius*, is very well distinguished by the pale

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yellowish markings at the base of the hindwing below, which somewhat resemble those of the ♀ of *E. manto.* It is one of the most distinct of all the Asiatic Erebias, and has, so far as I know, only been found in the Altai mountains, though it is also recorded (on what authority I do not know) from the Amur region.

Erebia manto.

This is a common but very variable species, always distinguishable by the markings of the hindwing below, which in the female are very distinct and unlike those of other species.

In certain localities it has a small high Alpine form (*pyrrhula*, Frey.), which seems to be constant on the Albula pass in the Engadine, and at San Anton on the Arlberg pass. Similar small specimens occur occasionally elsewhere.

In the Pyrenees it occurs in a very distinct form usually referred to *cæcilia*, Hübn. This is quite black without any markings in the male sex, and with only an indistinct band in the forewing below, and sometimes a trace of the outer band in the hindwing.

Something like this occurs rarely as an aberration in the Alps, but I have never seen one quite like the Pyrenean insect, and if the clasp were not identical, I should be disposed to separate this. As however I am not certain whether true *manto* occurs in the Pyrenees or not, I think it best to wait.

Erebia ceto.

Another common species, varying very much in different localities. On the south side of the Alps it usually has a well marked band of seven chocolate streaks of which three, four or five contain black ocelli sometimes, especially in the female, pupilled with white. On the Col de Lauterets in the Western Alps it is much smaller, and the markings are much less distinct, though of the same peculiar type.

Erebia medusa.

The opinion expressed by Strecker, which I quoted, as to the probability of *epipsodea* being the American form of

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this insect is not confirmed by an examination of the genitalia, which show *epipsodea* to be quite distinct.

The varieties *uralensis* and *polaris*, which have also been separated, prove to be without doubt only well-marked forms of *medusa*. Though *uralensis* on its underside resembles *epipsodea* much more than *medusa*, the form of its clasp is that of *medusa*. Several specimens from the province of Irkutsk in Siberia sent to me by M. Alphéraky are intermediate between Scandinavian *polaris* and Alpine *medusa*, the males being like *medusa* and the females nearer to *polaris*.

Erebia œme, var. *spodia*, Stgr.

This form, which on the upper side resembles *medusa* more than typical *œme*, and of which the larva is said by Ruhl to be like that of *medusa*, proves to be rightly placed as a variety of *œme*, which it represents in the Alps of Salzburg and Styria. Struve records this form from the Port de la Picade in the Pyrenees, but all those I have taken and seen in the Pyrenees at Luchon and Cauterets are typical *œme* with the ocelli not more developed than in the Alps.

Erebia hippomedusa.

This is a small form which occurs in the S.E. Alps and is very difficult to distinguish from *spodia*. Whether, as Staudinger thinks, it is a form of *œme* rather than of *medusa* I have not sufficient evidence or material to decide, but at Trafoi it seems to occur as a variety and not as an aberration, which many of the so-called *hippomedusa* in collections seem to be.

Erebia epipsodea.

Since I wrote last I have collected *epipsodea* myself in many places. It seems to be a most wide-ranging species and as much at home in the open prairies at 2–3,000 ft. elevation as on the high alps of Colorado and the Northern Rockies. It is a very variable species, and I now think that what I called var. *brucei* must be looked on rather as an aberration occurring rarely in various localities than as a local alpine variety, as I formerly supposed. Anyhow,

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I found no more of it in the region where Bruce discovered it, and besides his original two specimens, only one other has, I think, been since recorded from the province of Assiniboia, N.W.T.

Dr. Chapman would take this species out of the position in which I place it next to *medusa*, on account of the different form of the clasp, but it seems to me so near *uralensis* and *polaris* that I prefer to keep it here.

Erebia melas.

The difficulty which I formerly found in understanding the geographical distribution of this species is now removed by the fact, proved by the form of the clasps, that the true *melas* does not occur in central Europe or the Pyrenees.

The only certain habitats which I know of at present for this species are the South-Western Carpathians, where it occurs abundantly in the neighbourhood of Mehadia at about 5,000 ft. elevation, and the mountains of Veluchi, in Northern Greece, where it has been taken by Dr. Kruper.

I have a single specimen with a ticket "Stens? Dalm." from the Vienna Museum, which seems intermediate between *E. nerine* and *melas*; it is probable that a form of one or other of these species exists on the mountains of Croatia and Dalmatia. The form which I took at Campiglio in the Tyrol is now proved to belong to *glacialis*, and not to *melas*, though at first sight it much more closely resembles the latter.

The colour of this species, when quite fresh, is black, and in one male taken at Mehadia by Miss Fountaine there is a distinct chocolate patch on the forewing below, sharply defined on the inside and including the three ocelli. A trace of this colour shows on the upper side, and in the female it is conspicuous on both surfaces. The ocelli of the hindwing, normally three in number but occasionally four, are sometimes wanting on the upper as well as the undersides.

Erebia lefebvrei.

This is without question a distinct species, confined to the Pyrenees and Asturias mountains. It has three

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forms which have been defined by Oberthür, Et. Ent. viii, p. 22, as *pyrenea*, inhabiting the Eastern Pyrenees, *lefebvrei*, the central Pyrenees, and *astur*, the extreme western extension of these mountains, called the Picos de Europa. I am unable to say whether these three races can be certainly defined, or whether they have intermediate variations and intergrades, but the latter case seems the more probable. All of them frequent steep stony slopes at from 6000–9000 feet elevation. The central form has the ocelli the most developed, and in the western form they are nearly obsolete.

Erebia hewitsoni.

This species, which I had previously treated as a form of *melas*, seems by the form of the clasp, as well as by the constantly present chocolate band on both wings and the more numerous and conspicuous ocelli, to be good and distinct; it has more resemblance to *evias* than to *melas*. It inhabits the Transcaucasian region, where it is found at Borjoin, Abbas Tuman and in Suanetia in May and June. Dr. Chapman thinks it nearer to *evias* than to *melas*, and I am quite ready to agree with him in this.

Erebia stygne.

A well-marked form of this, which seems to be prevalent in the Valais of Switzerland, which I also found constant on the Splügen pass, and which occurs also in other parts of Switzerland, but never, so far as I know, in the Black Forest or Pyrenees, is better worthy of distinction than many which have received varietal names. It has the rufous band on both wings above nearly or entirely wanting, though usually there is a trace of it round the ocelli, which are very small and inconspicuous. On the underside the band is also much reduced, the ocelli are small, and in the female the hindwing below is much more uniform in colour.

This, though perhaps a local, is not an alpine variety, as I have from Zermatt, from Briançon and from Lanslebourg, on the Mont Cenis, the normal form. I propose to distinguish this as var. *valesiaca*.

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Erebia nerine.

This is a species confined to the eastern alps, occurring in the Lower Engadine and valleys south of the Stelvio pass, in great abundance at Riva as low as 1,500 feet, where I took it fresh on very hot rocky slopes as late as the end of July, at Campiglio, up to 5,000 feet, and on the Mendel Pass, in the Italian Tyrol, where Mr. Tutt found it still fresh on August 11th. A variety, which is called *reichlini*, H.-S., occurs in the Salzkammergut and differs from the typical Tyrolese form in having the chocolate bands of the forewing above faint and ill-defined and the ocelli smaller. On the underside the ocelli of the hindwing are faint or absent.

Another variety, *morula*, Speyer (*cf.* Stgr., Iris, viii, p. 286), which Staudinger calls a small alpine variety, is distinguished in typical ♂ specimens by the almost uniform dark-brown colour of the hindwing below, without the whitish dusting which in many of the typical forms almost forms an irregular band. I do not know where, if anywhere, this form occurs as a variety. "Schluterbach" and "Preth" are two localities, and the Leisser Alp in South Tyrol is cited by Ruhl. Mr. Tutt, at a meeting of the Entomological Society, disputed the possibility of separating these named forms, and exhibited a long series showing considerable variation from the Dolomite Alps. But the few specimens I possess of *reichlini* and *morula* do show the differences mentioned by Staudinger, and none of those I saw of Mr. Tutt's or of my own taking, agreed with them; so that I am inclined to let these varietal names stand.

With regard, however, to the var. *stelviana*, Curo, with which specimens in Frey's collection, named var. *italica*, are identical, and of which I have specimens from the Stelvio pass, Bormio and the Val Muranza, I can see no difference from the typical form worth noting.

Nerine may easily be confused with some forms of *E. pronoe*, from which however the underside always furnishes a distinctive character. It may also in some forms be confused with large brightly marked specimens of *E. stygne*, which has the inner side of the band on the forewing below always sharply defined (also the case in *E. evias*); whilst in *nerine* the chocolate colour is diffused, spreading to the base of the forewing below.

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Erebia scipio.

This seems to me to be really the nearest ally of *nerine* and represents it in the Western Alps. It is probably only a form of it separated by a widish interval of country, in which so far as I know neither form occurs; and the females are much more distinct below than the males. An interesting account of its habits is given by Mr. Tutt in the "Proceedings of the South London Entomological Society" for 1897, p. 63.

Erebia pronoe.

The species varies to some extent, but the so-called var. *pitho*, in which the bands and ocelli are less distinct or absent is inconstant. Frey says that typical *pronoe*, the usual form in the Austrian Alps and Tyrol, does not occur in Switzerland, but I have taken an example at the Rhone glacier in the Upper Valais which cannot be distinguished from *pronoe*. I have seen no good series of the so-called var. *pyrenaica*, but do not think it is at all constant; and the so-called *melancholica* from Armenia is almost certainly a form of *æthiops*.

Erebia gorgone.

This which I previously placed as a form of *gorge* proves to be a species separable, not only by its genitalia, but also by the white veins of the hindwings below, from *gorge* which also occurs in the Pyrenees.

Erebia melancholica.

This which I formerly placed with doubt under *pronoe* must now I think be dropped out of the list of species altogether. Specimens from Lederer's collection lent me by Dr. Staudinger, and probably of the same origin as the type, are inseparable so far as I can judge from *æthiops*, and no fresh ones have been obtained.

Erebia sedakovi, var. *alcmena.*

This was described by Grum-Grshimailo from the province of Amdo in Northern Tibet and has also been found

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in the Sinin Alps, which I cannot find in the map but which I believe are farther east towards Koko Nor, and southwards to Ta-tsien-lo, where Leech says it differs from the typical specimens in the paler fascia of the forewings, and grayer colour of the hindwings below. Alphéraky, speaking of specimens from Ta-tsien-lo, says that they are intermediate between the Siberian type of *sedakovi* and those from the Sinin Alps. I have specimens in my collection from the Sinin Alps sent by Alphéraky which are quite similar to *æthiops*, and I very much doubt whether either *sedakovi* or *alcmena* could be separated from *æthiops* if a large series were brought together.

This seems to be the only true *Erebia* found in Tibet or China.

Erebia vidleri, sp. n.

I describe under this name a species which is only known at present from specimens taken by Capt. Vidler on the mountains above Seton Lake, near Lilloet on the Fraser river, British Columbia, in July 1885. For a pair of these I am greatly indebted to Mr. Fletcher of Ottawa; though the male is in a very worn condition they afford sufficient material for description, which I here give.

In size, colour and markings like *E. sedakovi*, of which at first I thought the insect might be an American variety. The difference in the genitalia, however, is too great to admit this supposition and I believe the species may best be placed near *ligea*.

The band on the forewing above is yellow brown in colour and extends right across the wing enclosing three small dark brown ocelli; of which the two upper ones are white-pupilled. The band on the hindwing is shorter than in *sedakovi*, only extending about half way across the wing and containing two brown spots of which the upper is very small.

On the underside the band on the forewing does not reach the costa and the band of the hindwing is very like that of *æthiops* or *sedakovi*.

Erebia margarita.

Judging from M. Oberthür's figure and description this is a very doubtful species. I believe it to be only an aberration of *neoridas* without ocelli on the hindwing. I have a

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specimen of this species in which the form of band of the forewing, which Oberthür considers as a distinctive character, is almost exactly as in *margarita*; and it seems that only one specimen as yet has been taken in a locality where *neoridas* is common. M. Oberthür says that the flight is different, but as he has not hitherto been able to procure more specimens of it, it must be extremely rare at Vernet.

M. Oberthür says that he expects the validity of this species to be contested, and that it is a practice with many entomologists to refuse to recognise species which they do not possess. I hope he will not put me among them because, though, as I have said, it is never easy to form a correct opinion in such cases without a good series of specimens, yet his excellent figure of *margarita* does enable me to see that taken by itself the insect is not nearly so distinct from *neoridas* as are many other forms of *Erebia* which are universally admitted to be only varieties.

Erebia ligea and *E. euryale*.

Though I have made a careful study of a very large series of these species, from most of the localities where they occur, in the British Museum and my own collection, which contains 125 selected examples, I have had the very greatest difficulty in coming to any conclusion about them, and though I have rewritten this article three times, I am still by no means sure that my conclusions are correct.

In my former paper on *Erebia* I treated them as variable forms of one species, and though I now think that *ligea* and *euryale* can in most parts of Europe be separated by the somewhat slight but fairly constant difference of their genitalia taken in conjunction with other characters, yet in North Europe, probably also in Siberia, forms occur which might be called by either name and even from the Tyrol I have specimens of whose specific identity I cannot be sure.

The facts, so far as I have been able to work them out, are as follows. In Central Europe, in woody places at low elevations, and in the Alps up to about 3,000 feet, the typical *ligea* alone occurs, a large species with broad rufous band across both wings above, in both sexes containing on the forewing usually four (sometimes only three) and on the hindwing usually three (but sometimes four) black

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ocelli; often in the male and almost always in the female pupilled with white.

On the male below the fulvous band is usually well marked on the forewing but faint and indefinite on the hindwing, and is bounded on the inside by a white streak, broadest and most distinct on the costa and often extended in a broken irregular line about half across the wing.

This streak will always distinguish the males of typical *ligea* from typical *euryale*, in which it is either absent or faint and irregular. In *ligea* ♀ there is usually a broad yellowish band on the hindwing below showing distinct ocelli; and sometimes the base of the wing is also fulvous. Often the band is greyish and then the base is also greyish, sometimes the band is absent and then the sexes are almost similar.

In the Carpathians, Balkan peninsula and Ural Mountains both species are said to occur, but I have seen only *ligea*.

From the Caucasus neither is recorded. In the Altai typical *ligea* is found, but some specimens from Dahuria which equal or exceed *ligea* in size seem to be a variety of *euryale*.

Ajanensis of Ménétries, which is common in Eastern Siberia in the Vitim district, the Venta mountains and along the Amur to its mouth, is inseparable from *ligea* though the fulvous bands are somewhat lighter in colour and the white streak below is more extended. I have seen as yet no example from North-West America which can be referred to *ligea*, but expect it to occur in Northern British Columbia or Alaska.

Euryale is even more variable than *ligea* and is typically a smaller and more alpine butterfly. In the Pyrenees and Alps it is common and occurs from about 3,000 to 6,000 or 7,000 feet. It also occurs in the Isergebirge of Silesia, where a variety with distinct bands and ocelli on the hindwing seems to be pretty constant.

In the Alps the bands and ocelli above are sometimes faint or nearly absent and in the male the hindwing below has often no rufous band and no trace of white, and the ocelli are often faint or absent. In the Dolomite region, especially at Heiligenblut, occurs a variety, *ocellaris*, Stgr.; this is fairly constant, and is well marked above by the absence of the rufous band, which is replaced by small

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rufous patches with black dots in the centre. In the female only white pupils sometimes occur. On the underside the rufous band is present on the forewing and the hindwing in the ♂ has a greyish band, usually faint in the male and conspicuous in the female.

In the Irkut district of Siberia a somewhat similar form occurs, but I have seen none from Western Siberia.

I know of no character by which the female of *ligea* can be certainly distinguished from *euryale*, and where the two species fly together, as I have found them do in the Vorarlberg and at Campiglio in Tyrol, I cannot tell the females apart.

In Central Italy Herr Calberla says the two species are distinct in their habitat, *ligea* inhabiting the region of deciduous trees, and *euryale* occurring on treeless slopes at a higher elevation. In the Alps typical *euryale* always extends to a much higher elevation than *ligea*, ascending to 6,000 feet or more, and is usually quite easy to distinguish.

The form described as *adyte*, Hübn., which from the genitalia I take to belong to *ligea*, occurs in the Alps so far as I know only as an occasional aberration; what are called *adyte* in collections are often only small *ligea*, or *euryale* with the markings of *ligea*.

But in the Dovrefjeld of Norway and in Saltdalen (probably elsewhere) a form of *ligea*, judging from its genitalia, which is called *adyte*, but which sometimes resembles *euryale* more than *ligea* and varies considerably, is found; and I have seen no specimens from Scandinavia whose genitalia are those of *euryale*. In Sweden more or less typical *ligea* occurs and on the east of the Baltic various forms of it such as *livonica*, Teich., which has the rufous band above much fainter and the hindwings below nearly unicolorous. This however seems to be inconstant. In Finland various forms occur, some of which seem nearer to *ligea*, and others, as *euryaloides*, Tengstr., in which the ocelli have nearly or quite disappeared, are more like *euryale* (Schilde says that *ligea*, *adyte*, and *euryale* are all found there and treats them as one species). What was described as *jeniseiensis* by Trybom is inseparable and most resembles Finland specimens. In France Sand reports *ligea* from Auvergne; but I have seen no French specimens.

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Erebia dabanensis and *E. tundra.*

When I last wrote on *Erebia* I had not seen either of these species, but owing to the kindness of M. Alphéraky, who sent me a series of the former from the Grand Duke's collection for examination, and to that of Dr. Staudinger, who lent me the ♂ type of *tundra*, I am better able to speak of them. They are both from the same region; *dabanensis* having been taken in the mountains of the Irkut river, by Lederer, and *tundra*, in the Chamar Daban range south of Lake Baikal. They are easily distinguished from any other Siberian species by the distinct band on the underside, and have a band normally composed of four chocolate or fulvous spots pupilled with black nearly in a straight line across the forewing above, and three similar spots on the hindwing. M. Alphéraky believes that the two species are identical, and I think he is right, as I can find no difference but a slight one in the form of the clasp; but the only known male of *tundra* is in too bad condition to be of much value. Dr. Staudinger sent me a ♂ of what he calls *dabanensis*, from "Ost Sajan" (see under *E. erinna*), which may not be the same as those taken by Lederer, and among those sent by M. Alphéraky was a female which may belong to another species. But whether these differences are simply due, as I believe, to variation or not, cannot be decided until more specimens are taken. I believe that the correct position of these species is not near *melampus*, as Staudinger thought, but near *meta* and *lappona.*

Erebia embla and *E. disa.*

Though these two have been regarded by most recent authors as good and distinct species, and though I am able to distinguish them by what seem to be fairly constant characters, yet I am now doubtful whether the opinion first expressed by Ménétries in his "Catalogue of the Lepidoptera of the Petersburg Museum," p. 105, afterwards questioned by him in his "Lepidoptera of Eastern Siberia," p. 35, and finally confirmed in a paper published in the "Bulletin" of the Academy of St Petersburg, 1859, p. 218, to the effect that they could not be separated was not correct. The differences which have been pointed out by Staudinger (Stett. ent. Zeit. 1861, p. 353), who took *disa* abundantly in Arctic Norway in June, and was

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of opinion that it was perfectly distinct from *embla*, principally consist in the presence on the hindwing below of *disa* of a line of crescent-shaped marks on the outer greyish coloured half of the wing. *Embla* in Europe never seems to have these, but in some parts of Eastern Siberia, in the province of Irkutsk, though not in Kamschatka, it has these markings more or less developed, and forms a kind of transition to *disa*.

Specimens from this region undoubtedly led Ménétries to form a contrary opinion to that of so good a judge as Staudinger. I have often observed in similar cases that the difference of opinion of really competent judges on such questions can nearly always be explained by the different materials before them, and can usually be reconciled when each has been able to see the same specimens.

The geographical distribution of *embla* and *disa* is inexplicable if we assume them to be two species, and is remarkable enough if we look on them as one.

Disa has been found, so far as I know, only in Arctic Norway and the Kola peninsula, where it flies at sea level, and in the interior of Lapland, from Junkersdal in the upper part of Saltdalen, just within the arctic circle on the Swedish frontier, where Schøyen found it in July, to Karasjok and Muonioniska, where the late Mr. Meinertzhagen took it recently on the 12th of June in quite fresh condition. Schøyen also reports it from Wojmsjoen and Wallengren from near Sorsele, both in Umea Lappmark, which is the most southerly record I have.

The only other locality which I know of for certain is near Laggan, in the Rocky mountains of British Columbia, where it is rare and local according to Mr. Bean. When I was there in July, 1893, its season was nearly over, but I saw two or three specimens, and caught one flying in open marshy pine woods, surrounded by marshy meadows, on the banks of the Bow river, two miles below Laggan. Its flight was quick, as described by Staudinger, who also says that at Bossekop it was restricted to grassy marshes. It settles on grasses, on which no doubt its larva lives. The American specimens agree with the type of what Hewitson described as *mancinus*, and differ from European ones in having the chocolate band of the forewing somewhat diffused through the cell, which therefore shows a chocolate tinge on both surfaces. A trace of this in the

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form of an obscure spot sometimes occurs in Norwegian *disa*, and therefore I am not able on the strength of three or four specimens of the male sex only to admit *mancinus* as a marked variety.

Disa, var. *mancinus*, is also recorded by Edwards and Strecker from Alaska, but I have been unable to obtain any specimens from there for comparison. The typical *disa* markings on the underside of the hindwing are not so distinct on the American as in the European specimens, and the form of the genitalia is identical.

Now, when we turn to *embla*, we find it local in Southern Norway, where Schøyen takes it in Odalen near Christiania in June; and Siebke says it was taken by Wocke at Sigstad in the parish of Loiten in Hedemark on May 30.

Wallengren states that in Sweden its most southerly habitat is in Dalarne, where Quensel found it at Serna, that it occurs at Lycksele in Umea Lappmark, at Jockinock and Storsand, and at Öfre Tornea in Tornea Lappmark, and as far north as Karesuendo. I have specimens taken by Lampa near Quickjock which in marking are very distinct from *disa* and as the ranges of *disa* and *embla* here overlap, it is possible that the two species may here be separated; it would be very interesting to have further particulars as to their occurrence together or separately.

In Finland Schilde found *embla* common on bushy moor meadows from the end of June to the middle of July, and says it is very variable, sometimes losing all the ocelli except those in cell 4 and 5 of the forewing. I have specimens from St. Petersburg and from Olonek, and then I know of no record of its occurrence until the province of Irkutsk is reached, where, as I have already said, the hindwing below shows a transition to *disa*. M. Alphéraky tells me that the collection of the Grand Duke Nicholas contains no *disa* from Siberia; and though Ruhl gives Irkutsk as a locality, he is probably only quoting Ménétries.

In the mountains near Urga on the Mongolian frontier a variety occurs which Staudinger calls *lama*, but this is not, so far as I can judge from the pair he sent me, to be distinguished from Norwegian specimens.

Alphéraky also describes in Romanoff's "Mémoires," ix, p. 325, from Kamschatka a variety of *embla* which he calls *succulenta* and he has been good enough to send me four males and two females; excepting that the ocelli are more

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developed as compared with those in examples from Vitim and Vilinsk, though not more so than in some Norwegian specimens, I do not see anything in them to justify a varietal name. If they are separated, however, the name must include specimens from Nikolaivsk.

Erebia rossi, *E. ero*, and *E. discoidalis*.

When I previously wrote on *E. rossi*, which I then knew only from Curtis's figure and description, I treated it as possibly a form of *disa*. Since then, through Prof. Aurivillius's kindness, I have had the opportunity of examining the single very bad specimen which was taken at St. Lawrence Bay in North-East Asia by the '*Vega*' expedition.

I find that the genitalia of this specimen agree precisely with those of what Strecker had sent me from Hudson Bay as *fasciata*, and of what M. Alphéraky sends me from Irkut in Siberia as *ero* of Bremer; and on referring to M. Oberthür, whose collection contains three of the type specimens of *rossi* given by Curtis to Guenée, he admits that they are very near *ero*. If this be so, we find that the species is much more widely distributed in arctic America and Asia than was supposed.

E. ero of Bremer, which was taken by Radde in the Apfelgebirge, which seems to be a local name for a part of the mountains marked in maps as the Yablonnoi range, about five days' journey east from Kiatcha, has never been refound in that locality by any recent collector, so far as I know. Staudinger speaks of it as "Diese mir unbekannte Art." I cannot be certain from the figure and description that it is the same as the form sent me from Irkut by Alphéraky as *ero*. If, as I think, this is probably the case, then the name of *ero* must give place to that of *rossi*, which has many years' priority.

The species may be distinguished from *disa* by the chocolate suffusion of the whole disk of the forewing below, by the range of small white spots on the margin of the hindwing below, and the absence of the dark lunules in the same place.

From *discoidalis* it is easily distinguished by the presence of ocelli on the forewing, variable in number, and resembling in size, colour and position those of *E. disa*.

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In the Hudson Bay specimens these ocelli are four or five in number, in Bremer's plate four, and in the Siberian specimens I have seen two or three.

There is a more or less distinct dark band followed by an outer paler one on the hindwing below, which is more visible in the American than in the Siberian specimens, and is hardly shown in Bremer's figure; but this is nothing like so distinct or well marked as in the true *fasciata*, which has a most distinct broad band below not only on the hindwing but right across the forewing and reaching the costa.

Erebia cyclopius.

A very distinct species in my opinion, though Dr. Chapman considers it a near ally of *embla-disa*. It extends from the Ural Mountains and eastern Altai to Amurland and the island of Askold, and appears to vary but little. The supposed variety of it described by Trybom from the Yenesei river as "var. *intermedia*," turns out from an examination of a specimen lent by Prof. Aurivillius to be *E. edda*, a very different species.

Erebia fasciata.

This, so far as I know, has never been taken except at Winter Cove in Cambridge Bay, Victoria Land, about 69° N., 107° W., by Capt. Collinson's expedition, and by Sir John Richardson's expedition on the Arctic coast in 67–68° N.

These specimens are all in the British Museum except one pair which I received in exchange from this source.

Erebia magdalena.

This species, which I knew before only from specimens taken by Mr. Bruce, is at present only recorded from the mountains of Central Colorado. I was fortunate enough, when visiting this country in July, 1893, to see and take it myself. It frequents just such steep stony slopes as *E. glacialis* prefers in the Alps, and it seemed fairly common at from about 11,800 to 12,800 feet. During the first week in July I found it easier to catch and not so

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strictly confined to stones and boulders as *glacialis*, but the great elevation and very uncertain weather of these high mountains make it a difficult species to procure in good condition.

I am inclined to think that a subgenus might be formed for *E. magdalena*, *E. erinna*, and perhaps *E. fasciata*; but I know so little of all of them at present that it may be better to wait before separating them from *Erebia*.

Erebia erinna, Stgr. Iris. vii, p. 247, t. ix, fig. 2, ♂ (1894).

Dr. Staudinger described this from a single pair from "Ost Sajan," probably a part of the mountains on the upper Yenesei river south of Minusinsk, which are marked in maps as the Sayansk mountains. M. Alphéraky very kindly sent me a damaged male, one of two which the Grand Duke Nicholas Mikhailovitch received from the Irkut river, which appears to rise in the very high mountains (over 11,000 feet) on the Chinese frontier, east of the Sayansk range; it may possibly be from the same source as the types. Staudinger compares the insect with *E. glacialis*, to which he says it stands next, but both the genitalia and the neuration are different from those of *glacialis*, and, as Dr. Chapman says, absolutely identical with those of *E. magdalena*, which is only known from the highest mountains of Central Colorado.

I can, in fact, distinguish it specifically from *E. magdalena* only by the brown colour of the disk and inner part of the forewing on both sides, which in *magdalena* are quite black like the rest of the forewing.

The name was first written *erynnis* by Staudinger, but afterwards in a footnote on p. 376 of the same volume changed to *erinna* on account of the similarity of the former spelling with the var. *erynis* of *E. gorge*.

Erebia afra.

This seems to be widely distributed over Southern Russia, and it occurs also in Asia Minor in the Altai Mountains and in the Turcoman country. The form which is isolated in Dalmatia (*dalmata*, Godt.) seems to

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be a well marked local variety if not worthy to be treated as a species. Of this I have lately procured a good series taken near Zara by Herr A. Spada, and am able to distinguish them certainly by the much darker colour of the underside, and the much less distinct marking of the veins on the hindwing below; in specimens from other localities these veins are pale grey throughout the wing, but in those from Dalmatia they are only faintly marked in the males, and in the females much less so than in *afra*. The average size also is larger, and the grey colour of the apex of the forewing above is more pronounced than in *afra*.

Christoph says that the specimens he took in the Tekke country belong to this form; but I have seen none from this locality.

On the two following pages is given the table previously referred to of the known species of *Erebia* and some of the principal varieties arranged so as to present the facts of their geographical distribution in a synoptic form.

JUNE 29, 1889.

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		Pyrenees of Spain.	Germany, excluding Alps.	Scandinavia.	Western Alps.	Central Alps.	Eastern Alps.	Italy excluding Alps.	Carpathians.
1	*epiphron*	×	×	...	...	...	...	...	...
	var. *cassiope*	...	...	...	×	×	×	×	×
2	*melampus*	...	...	...	×	×	×	×	×
3	*kefersteini*	...	...	...	...	...	...	...	...
4	*flavofasciata*	..	...	...	...	×	...	...	...
5	*eriphyle*	...	...	...	...	×	×	...	...
6	*arete*	.	...	...	...	...	×	...	...
7	*christi*	...	...	...	...	×	...	...	...
8	*mnestra*	...	...	...	×	×	×	...	...
9	*pharte*	...	...	...	×	×	×	...	...
10	*maurisius*	...	...	...	...	...	...	...	...
	var. *pawlowskyi*	...	...	...	...	...	...	...	...
	var. *haberhaueri*	...	...	...	.	...	...	...	...
	? var. *sofia*	...	...	...	...	...	...	...	...
11	*theano*	...	...	..	...	...	...	...	...
12	*manto*	?	...	...	×	×	×	...	×
	var. *cæcilia*	×	...	...	...	...	...	...	...
13	*ceto*	× (Sand)	...	...	×	×	×	×	×
14	*medusa*	×	×	...	×	×	×	×	×
	var. *polaris*	...	...	×	...	...	...	...	...
	var. *uralensis*	...	...	...	...	...	...	...	..
15	*æme*	×	...	...	×	×	×	×	×
16	*epipsodea*	...	...	...	...	...	...	...	...
17	*melas*	...	...	...	...	...	...	...	×
18	*lefebvrei*	×	...	...	...	...	...	...	...
19	*stygne*	×	×	...	×	×	?	×	...
20	*nerine*	...	...	...	...	×	...	...	...
21	*scipio*	...	...	...	×	...	...	...	...
22	*glacialis*	...	...	...	×	×	×	×	...
23	*evias*	×	...	...	×	×	...	...	...
24	*hewitsoni*	...	...	...	...	...	...	...	...
25	*tyndarus*	×	...	...	×	×	×	×	...
26	*gorge*	×	...	...	×	×	×	×	×
27	*gorgone*	×	...	...	...	...	...	...	...
28	*goante*	?	...	...	×	×	×	...	×
29	*pronoe*	×	...	...	×	×	×	...	×
30	*æthiops*	×	×	...	×	×	×	×	×
	var. ? *alcmene*	...	..	...	...	...	...	...	...
31	*sedakovi*	...	...	...	...	...	...	...	...
32	*vidleri*, sp. n.	...	...	...	...	...	...	..	...
33	*neoridas*	×	...	...	×	...	...	...	...
34	*zapateri*	×	...	...	...	...	...	...	.
35	*ligea*	? (Sand)	×	×	×	×	×	×	×
36	*euryale*	×	...	...	×	×	×	×	×
37	*meta*	...	...	...	...	...	...	...	...
38	*lappona*	×	...	×	×	×	×	...	×
39	*ocnus*	...	...	...	...	...	...	...	...
40	*sibo*	...	...	...	...	...	...	...	...
41	*dabanensis*	..	...	...	...	...	...	...	...
42	*turanica*	...	...	...	...	...	...	...	...
43	*embla*	..	...	×	...	...	...	...	...
44	*disa*	...	...	×		...	...	...	...
45	*rossi* (*ero*)	...	...	...	...	...	...	...	...
46	*edda*	...	...	...	...	...	...	...	...
47	*cyclopius*	...	...	...	...	...	...	...	...
48	*tristis*	...	...	...	...	...	...	...	...
49	*discoidalis*	...	...	...	...	...	...	...	..
50	*epistygne*	...	...	...	×	...	...	...	...
51	*afra*	...	...	...	...	...	...	...	...
52	*fasciata*	...	...	...	...	...	..	...	...
53	*magdalena*	..	...	...	...	...	...	...	...
54	*erinna*	...	...	...	...	...	...	...	...

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	Balkan Pen.	Caucasus and Armenia.	Ural and N. Russia.	Mounts of Altai, Alatau, Tarbagatai.	Pamir and Hindu Kush.	Arctic Asia, Dahuria, and Mounts of C. Siberia.	Amur Region.	Tibet.	Colorado and Rocky Mountains, U.S.A.	British N. America.	Arctic America.
1	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	? ×	...	×	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	×	...	×	...	...	...	...	...
	...	...	...	...	...	×	...	...	...	...	...
	...	...	...	×	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	×	...	×
11	...	...	...	×	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...
14	...	×	...	...	...	×	×	...	...	...	...
	...	...	...	...	...	...	...	...	...	...	...
	...	...	×	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...
17	×	...	...	...	...	...	...	...	×	×	...
18	...	...	...	...	...	...	...	...	...	...	...
19	...	×	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...
24	...	×	...	...	...	...	...	...	...	...	...
25	×	×	...	×	...	×	...	...	×	...	...
26	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...
30	×	×	...	×	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	×	...	...	...
31	...	...	...	...	...	×	×	...	...	...	...
32	...	...	...	...	...	...	...	...	...	×	...
33	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...
35	×	...	×	×	...	×	×	...	...	...	...
36	×	...	×	...	...	×	...	...	...	...	...
37	...	...	...	×	×	...	...	...	...	...	...
38	×	...	...	...	...	...	...	...	...	...	...
39	...	...	...	×	...	...	...	...	...	...	...
40	...	...	...	×	×	...	...	...	...	...	...
41	...	...	...	...	...	×	...	...	...	...	...
42	...	...	...	×	...	...	...	...	...	...	...
43	...	...	...	...	...	×	×	...	...	...	...
44	...	...	...	...	...	? ×	...	...	...	×	...
45	...	...	...	...	...	×	...	...	...	...	×
46	...	...	...	...	...	×	×	...	...	...	...
47	...	...	×	...	...	×	×	...	...	...	...
48	...	...	...	...	...	...	×	...	...	...	...
49	...	...	...	...	...	×	×	...	...	×	×
50	...	...	...	...	...	...	...	...	...	...	...
51	Dalmata	×	×	×	...	...	...	...	...	...	...
52	...	...	...	...	...	...	...	...	...	×	...
53	...	...	...	...	...	...	...	...	×	...	...
54	...	...	...	...	...	×	...	...	...	...	...

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OCT 25 1898

XIII. *A Review of the Genus* Erebia, *based on an Examination of the Male Appendages.* By THOMAS ALGERNON CHAPMAN, M.D., F.E.S.

[Read February 16th, 1898.]

PLATES V—XVI.

THE Erebias have a certain fascination for many of us, not only because they have a very real interest of their own, but because of their association in memory with those excursions amongst the mountains, which we regard with good reason as the most genuine form of holiday and recreation.

Though myself under this influence for many years, it was only recently that I determined to make some endeavour really to understand the various puzzling questions as to the limits of specific forms within the genus, questions upon which no very certain sound emanated from any of our authorities. I hoped also to learn something of the mutual relationships of distinct species, inasmuch as all published lists appear to me to mix up species of different affinities without any obvious method of rational or other classification.

With this object I especially determined to examine the male appendages of all forms that had any claim to specific distinction. I had got well on the way when I found that Mr. Elwes had undertaken a fresh revision of the genus and was making a similar examination of these special structures. Since then, we have in some degree divided the work and compared our results, to such effect, that I believe there is no point of any moment, if indeed any at all, as to which we arrive at different conclusions, though we may vary a little as to our method of presenting them.

I have left to Mr. Elwes all questions of bibliography, nomenclature, description, geographical distribution, &c. for which I am but poorly equipped, and in fact all questions except those arising out of the forms of the male appendages. These questions I have more particularly

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worked out, but with so much collaboration and assistance from Mr. Elwes, that he is quite able to accept the conclusions from my work as readily as if he had arrived at them without my assistance; as doubtless, in fact, he would have done had I not relieved him of the necessity of following this line of research more exhaustively. I have to acknowledge the assistance received from him in various ways and from various other friends for specimens and material; of these I may mention Messrs. Nicholson, Tutt, Jones, &c.

I do not propose to discuss the homologies of the organs forming the male genital armature in *Erebia*. They consist of the following portions:—An upper portion, the tegumen (tegmen ?) or sicula (uncus and scaphium ?), with a central and two lateral processes; two lateral portions, the clasps or valves (combined valvæ and harpes ?); a ring of chitin continuous with the tegmen and supporting the clasps; the penis; two chitinous ridges between the ring and the penis on either side.

In *Erebia* as in most other Lepidoptera, it is the clasps (or valves) that present the most distinctive characters in different species, so that in nearly all cases the species may be at once named from its clasp; and this being so, one naturally pays less attention to the other appendages, which with a closer study might probably be found to be equally characteristic.

The tegumen or sicula (why not anglicise this as 'sickle'?) varies comparatively little as regards the central or upper process, which usually has a somewhat regular curve, and a nearly equal diameter throughout; its chief variation is in length and the sharpness or bluntness of the tip. Here dried specimens are apt to be deceptive, from twisting and curling, especially if previously treated too freely with alkaline preparative. The lateral arms are more variable, they almost always have a slight curve and taper to a point, but they may be longer or shorter, more or less sharp, and so forth. In a few instances they are distinctive; thus in *E. æthiops* (Group III), viewed laterally, they are seen to be expanded at the end and to terminate obliquely at nearly their full width instead of in a point. In *E. radians* they are of nearly equal width throughout, sweep round in an S-curve and terminate in a rounded end. In *E. disa*, *E. embla* and *E. cyclopius*, they expand at the extremity into a racket-shaped disc, a form to

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which there is no approach in any other species. The other parts I have not studied, so I can only say that, in some species at least, they present marked characters.

Since the sickle is so constant in form in *Erebia* and in neighbouring genera presents many considerable variations, one might say from an Erebian stand-point that the sickle presented generic characters, whilst those of the clasp were specific; for in the allied genera we find forms of clasps very like in general outline to those of some Erebias. Were we to adopt clasp forms as generic characters, there would be extreme confusion; thus *Erebia œme*, *Enodia hyperanthus*, *Chionobas brucei* and *C. aello* would be in one genus, *Hipparchia semele*, *Erebia glacialis* and *Chionobas chryxus* in another, and so on. It is, perhaps, not quite correct to say this without noting that, though there is this great similarity of form, there is a recognisable something distinguishing the clasps of the Erebias, chiefly perhaps, that throughout the genus, they exhibit a vigour and strength about the spines or styles which is rare in the neighbouring genera.

This circumstance emphasises the necessity of always interpreting the evidence of the appendages with close regard to other characters, and though most valuable for distinguishing separate species, otherwise much alike, it must only be used to unite those as to which such a presumption can be otherwise supported.

Nevertheless it is by no means futile to attempt some sort of classification of the forms of the appendages as an indication of the relationship of the species. Indeed, I think, in most cases the appendages give a more certain indication of alliances than is derivable from wing forms and patterns; because, in *Erebia* the variety in the appendages is of a much less erratic character than it is said to be in many other genera, where close alliance otherwise is often associated with the greatest diversity in the appendages; whilst it also happens that *Erebia* is especially a genus in which colour and marking are very misleading. The case of *E. melas*, in which varieties of two very distinct species (*E. nerine* and *E. glacialis*) were associated as one with a third species, *E. lefebvrei*, itself possibly really a variety of another species (*E. pronoe*), is by no means a solitary instance of confusion that an examination of the clasps corrects.

Some such form of clasp as that of *E. manto* or

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E. euryale may be assumed to exhibit the most normally developed type—presenting a base, body or shaft, a lobe or shoulder, and a hind process with a neck and head. This would describe the outline of the clasp, as viewed laterally, or at such an angle as will throw the spinous margin into profile along the edge.

It is perhaps hardly necessary to say anything as to the difficulty in securing the same point of view in comparing different clasps, or in making the necessary allowance for any want of such exact correspondence. Having got over these difficulties myself, I may perhaps not make sufficient allowance for them in presenting the results so as to be clear to others. I have, however, endeavoured to avoid them as far as possible in the rough sketches that I present, so that they will support my statements without explanations as to the aspect shown, &c. These sketches are all taken with the camera lucida and to the same scale.

I have adopted the method of preserving the preparations in balsam, on ordinary microscopic slides, with as little pressure as possible; a method that has several practical advantages, though it is not free from objection.

I have not examined the appendages of every named variety, but have done so in nearly all cases, including all those where there seemed any possibility of specific differences; *E. margarita*, a species founded by Oberthür on a single specimen, and possibly a form of *neoridas*, is the only one I have not seen. In the case of all other species, I have examined material that has fairly satisfied me, in so far that, whilst in several instances I should have desired more and more varied material, I do not think the want of it has led me to any erroneous conclusions. How far, of course, this confidence is justified remains to be proved.

In arranging the species of the genus in accordance with the structure of the clasp, a certain group of species, with a definite clasp form, together with several others probably derived from this one, at any rate, unlike the remainder of the genus, is found to have a neuration differing from the rest; and, as the former species further are almost all of Asiatic and American distribution, whilst the rest are chiefly European, it seems best to divide the genus first into two sections.

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SECTION A, the European section, has vein 10 arising from the cell separately; the clasp usually has an obvious, frequently a long, neck.

SECTION B, the Asiatic section, has vein 10 arising from vein 7; in the clasp of one or two species only is any suspicion of a neck present, and it would not be absurd to suspect that the style-bearing surface is the head, and that the shoulder is absorbed into the shaft.

Section A is divisible into seven or eight groups and B into two or three. It is as obvious here as elsewhere that no linear arrangement is satisfactory. By placing certain groups in their most satisfactory linear arrangement, the equally real relationship of other species finds no expression. Thus, as I have arranged the species, the *embla* group is placed after the last and least typical members of the *neoridas* group, whereas its probable alliance is with the earlier forms; if this were expressed, *E. evias* might find a more natural position, *E. neoridas*, *nerine*, *embla* and *evias* being representatives of these allied branches. The latter members of the *neoridas* group would then come into relation with *E. medusa* and the eastern group, with which *E. embla* seems to be in no relation.

The *manto* or *euryale* clasp may be taken as the most pronounced form of clasp in the first group, which contains *E. ligea*, *euryale* and *vidleri* as a first division, and the Grass Erebias as the second. In these there is a gradation from *E. manto* and *eriphyle* with the well-marked typical outline, through forms in which the lobe or shoulder sinks and disappears, to *E. flavofasciata*, in which from base to head the line of styles presents no irregularity. The species are *E. manto*, *eriphyle*, *melampus epiphron*, *pharte*, *arete*, *christi*, *kefersteini* and *flavofasciata* The name "Grass Erebias," a name I have heard applied to these species, on what authority I do not know, at first seemed to me rather absurd as all Erebias are grass insects. It is intended no doubt to mark them as not being rock or wood species; at any rate, a name for a group is very desirable if we can get one on any reasonable terms.

These "Grass Erebias" are those that puzzle one in the field, and even in the cabinet perhaps, more than any others. It is therefore very satisfactory to find that the

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forms of clasps are quite distinct in all the nine species, and especially that they are most markedly so in precisely those species that are most frequently confused or likely to be so. Thus *eriphyle* is not unlikely to be associated with *melampus* or with *pharte*, and its specific distinctness has even been denied; but the clasp is widely different from that of either of these species, though it somewhat resembles that of *manto*. *Eriphyle* is not likely to be often taken for that species; yet, as a matter of fact, though I took *eriphyle* freely last year in Carinthia, and ought to have known it well enough, I also took it at Innsbrück and at St. Anton, but left the specimens mixed with those of *manto* until an examination of the clasps called my attention to them. Then I found no difficulty in separating them. *E. pharte* and *melampus* are also likely to be confused, and have even been stated to be one species, interbreeding together. The clasp forms are, however, abundantly distinct. Again, *E. epiphron* and *christi* might be confounded, but the clasp forms are very different.

SECTION A.

Group I. *a*. The close resemblance of the clasp of *E. manto* to that of *ligea* is extraordinary; and we meet here at the outset the most puzzling question that the appendages afford us throughout the whole genus. I separate *ligea* and *euryale*, on the one hand, from the Grass Erebias on the other, as a subgroup, owing to their general differences; the clasps would place them as almost identical. That they are really closer than their general facies suggests was curiously proved to me by a not at all extraordinary form of *euryale*. All the Erebias have essentially the same fasciæ on the underside of the underwing, but these are marked out in *manto*, notably in the female, in a peculiar manner, by angular, pale patches. In the specimen of *euryale* I allude to, the *manto* markings were quite distinct.

We have to deal with not more, I think, than four forms, viz., *ligea*, *euryale*, *manto* and *cæcilia* (Pyrenees). I am unable to recognise any of these with absolute certainty by the clasps.

The *ligea* group is distinguishable from *E. manto* by the slight but distinct tendency of the lateral pro-

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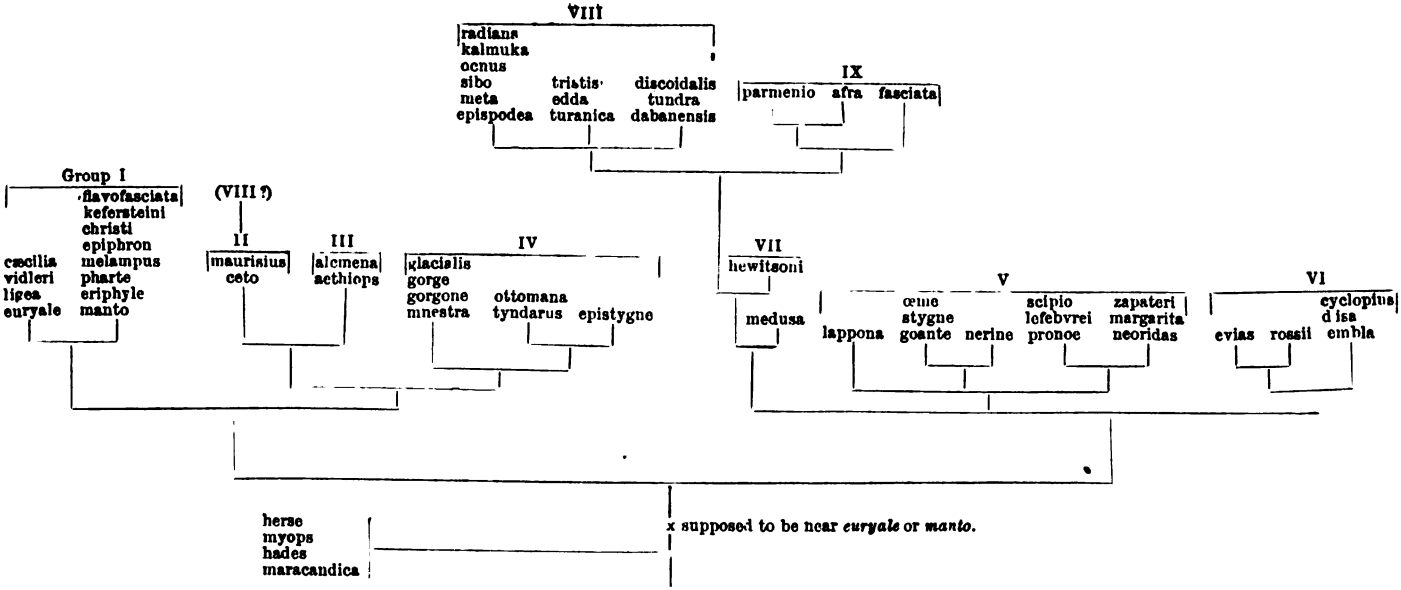

A CLASSIFICATION OF EREBIAS THROWN INTO THE FORM OF A PHYLOGENY.

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cesses of the sickle to broaden out in something of the *æthiops* manner, whilst in *manto* they come to a point. After examining a large number of the *ligea* group, with varieties *adyte*, *ajanensis*, *ocellaris*, &c., I do not feel at all clearer than before as to there being more than one species. The clasps of *ligea*, *adyte* and *ajanensis* (Fig. 1) have a rather bolder shoulder or lobe, marked off both at the neck and towards the base, and those of one or two specimens of *ocellaris* go to the contrary extreme in having very little neck; whilst *euryale* (Fig. 2) usually has a neck similar to *ligea* but the lobe is not definitely marked off towards the base. Still, even *ocellaris* sometimes makes an approach to the *ligea* form, so that it is difficult to avoid a suspicion that the more pronounced character in *ligea* is due to its being usually a larger and better-fed insect.

Without being able to give any very good reason for the belief, beyond an impression gained in the field, I think that the two recognised forms, *ligea*, with its vars. *adyte* and *ajanensis*, and *euryale*, with var. *ocellaris*, whilst usually distinct, are not always so, and in some places intermix. The clasp differences are not great enough to render this otherwise than likely where they occur together on the same ground.

The Swiss form known as *cæcilia* is no doubt *manto*, but the Pyrenean *cæcilia* (Fig. 3) cannot be so easily dismissed. In it the clasp is similar to that of *manto*, with rather more pronounced styles; but there is the essential difference that the lateral processes of the sickle are widened out like those of *ligea*, at least as much as in that species: while this seems to make it impossible for it to be *manto*, it is difficult to regard it as a form of *euryale*. An examination of the other portions of the appendages gives us no further assistance; there is a slight difference in average size, but varieties in each form overlap. I think we must conclude that *cæcilia* (Pyrenees) is not a variety of *manto*, and if it be not a variety of *euryale* it is a distinct species. Were it a variety of *euryale* one would expect to find some trace of the chequered fringes. I place it therefore as a good species and in the first division of Group I.

A new species which Mr. Elwes proposes to describe under the name *vidleri* (Fig. 4), has very much the aspect of a form of *æthiops*, but the clasp prepared by

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Mr. Elwes from his single male specimen is very different from that of *æthiops*, having a margin of styles along nearly its whole length and spreading at the head over a considerable surface: it is nearly straight and the open side extends nearly to the head. The most natural place of the species is, therefore, apparently, as a member of the *ligea* group, but related to *ligea* much as, say, *flavofasciata* is to *manto*. I cannot, however, avoid the belief that *vidleri* may prove to be the American representative of *æthiops*, and that some accident has, perchance, attributed to this specimen a substituted clasp.

b. 1. *E. manto* (Fig. 5). I have already discussed the form of clasp in this species. The neck is rather longer and narrower than in *ligea*, and the shoulder drops to it rather suddenly and precipitately, but this is merely a general or average difference not holding good for all specimens. There is also, perhaps, a little more variation in the direction of large and bold styles on the shoulder, interfering with its regular outline, but I could not propose to name with certainty any individual clasp of either species. The sharpness of the lateral process of the sickle in *manto*, compared with the spathulate tendency that it exhibits in *ligea* and *euryale*, can, however, I think, be depended on. *Pyrrhula* is merely a local variety, but its clasp varies rather more than in typical *manto*. An odd specimen (from an old collection), stated to be a Swiss example of *pyrrhula*, and not unlike it, has a very different clasp, more like that of *E. pharte*. It is certainly not *manto*, but I must hope for more material before going further, and only mention it here to call attention to a possibly unrecognised species (Fig. 8, *k*, *l*).

2. *E. eriphyle* (Fig. 6). The clasp has the same general outline as that of *E. manto*, but it is very smooth and regular by comparison, owing to the smallness and uniform size of the styles; and this character suffices to distinguish the species in the many specimens of both that I have examined. A critical distinction, however, may be found in the sickle, the total length in *manto* being 1·88 mm. and in *eriphyle* 1·50 mm., or about as 5 to 4.

The clasp in the remaining species of the group has no very definite lobe or shoulder, but a neck and head are usually definitely marked off from the body or shaft.

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3. *E. epiphron* (Fig. 7). The clasp of this species with which *cassiope, nelamus* and other named forms agree, has a slight fulness preceding the neck. The neck and head are rather less than a third of the total length of the clasp, the styles being numerous, very small and of tolerably uniform size. In *nelamus* the clasp is slightly shorter and the basal styles more frequently somewhat longer.

4. *E. pharte* (Fig. 8). The commencement of the neck is not very distinct, but the neck and head appear to be about one-fourth of the total length of the clasp. The styles are large and bold, rather rounded than pointed,—indeed several near the base are mere rounded nodules; they may be very few in number, those basal to the neck being, in some specimens, even as few as five or six, in others as many as sixteen in a double row.

5. *E. melampus* (Fig. 9). There is no lobe; the neck and head are fully two-fifths, sometimes almost half the total length of the clasp, and of fairly uniform diameter. The neck and head have numerous small spines in two rows; on the body there are usually five or six larger sharp spines with two or three small ones in each interval, but there is a good deal of variation in this.

6. *E. arete* (Fig. 10). The neck with the head is about one-third of the total length of the clasp and has a very regular series of about 8 spines with smaller ones between; on the body are 8 to 12 spines of larger but again of fairly uniform size, and traces of others between.

7. *E. christi* (Fig. 11). Head and neck about a third of the total length: they carry about 8 bold spines, the 4 distal rather the smallest and the 4 proximal sometimes reduced to two; no intermediate spines. The spines on the body are few and often reduced to mere round nodules; the distal ones may be large and bold, though rounded.

8. *E. kefersteini* (Fig. 12). The position of the neck is usually quite obvious. The neck and head carry about 16 styles in two alternating rows, the basal ones being few, one or two to five or six. The styles in

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this species are more markedly bent inward into actual hooks than in any other species of this group.

9. *E. flavofasciata* (Fig. 13). The clasps of this species are of much more delicate texture than those of the others of this group, or indeed of any *Erebia*, and are easily bent and twisted: they are also narrower and, when flattened out, form a triangle about half the width at the base of the clasp of *E. pharte* or *arete* similarly examined. The styles, especially those of the neck and head, which are not clearly marked off from the body, are smaller and more delicate than those even of *E. epiphron*. A specimen from the Engadine agrees precisely with those from Campolungo.

Group II. In the next group the clasp has no spines on the body or shaft, and the shoulder, instead of occupying about the middle of the shaft, is much nearer the head. The combined shoulder and head have a continuous margin of spines, the neck being a mere depression in this margin. There is a distinct narrowing and bending of the body to the basal side of the shoulder, forming a neck, which, however, is not what I have called the neck in the other groups. (Groups I, IV, V, etc.). This group includes *E. ceto*, and an Asiatic species, having several named forms, which are possibly all one species, certainly not more than two. I doubt there being much real relationship between *E. ceto* and this form, but the clasps are almost identical.

1. *E. ceto* (Fig. 14). This has a longer central process to the sickle than the others, whilst the spinous margin of the clasp is rather shorter and the styles somewhat smaller.

2. *E. maurisius* (=*haberhaueri*) (Fig. 15). This form has a central process of the sickle nearly as long as in *E. ceto*, and the spinous margin of the clasp perhaps a little longer than in *E. pawlowskyi*.

3. *E. pawlowskyi* (=*ethela*=*theano*) (Fig. 16). This species has a shorter central process to the sickle. The differences in the clasp are hardly, if at all, appreciable.

I do not know how much value to attach to the length of the sickle in this group; it is possible it may

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be little, and that a longer series would break down the distinction. The appearance of the butterflies certainly suggests that they are all the same, unless five distinct species are upheld, which appears inadmissible.

In this Group II, I feel little doubt that *E. ceto* is properly placed, but the remaining form or forms suggest to me certain doubts that must for the present remain unanswered. The forms of the appendages are very close to those of *ceto;* the facies is closely related to *manto*, the peculiar marking of the underside of *manto* being exaggerated and repeated on the upper surface. The neuration is that of the European section. On the other hand the geographical distribution is Asiatico-American, and the forms of the appendages range very fairly with the most typical section of the Asiatic forms (Group VIII). My doubts are not, perhaps, so much as to this being properly placed, but rather as to whether this, rather than the neighbourhood of *medusa*, is not the starting point of the Asiatic section; or, perchance, whether the Asiatic group is not really two distinct groups, one arising at each of these points. A knowledge of the early stages may resolve these questions, especially a knowledge of the forms of the eggs, which are often very distinctive in Erebias. My group VIII would in this case be the one arising from group II, and group IX that from group VII.

Group III. We pass naturally to the next group, in which the clasp is an exaggeration of that in group II. The body is extremely long and the combined head and lobe very short, about one-fifth of the total length of the clasp (in *E. æthiops*). The side-processes of the tegumen have been already referred to.

1. *E. æthiops* (Fig. 17). The named forms of *æthiops* have appendages differing less from each other than do those of Scotch *æthiops* from the others. The difference is almost entirely one of size, the ratio being as 5 to 6, the Scotch being the smaller. The other named forms are identical with European *æthiops*, *e.g.*, *melusina*, *sedakovii*, a faded-looking *æthiops* from Asia, and the pale *niphonica* from Japan. If any variety is entitled to specific distinction it is that found in Britain. I entertain no doubt they are all one species.

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2. *E. alcmena* (Fig. 18). This species, which has been variously treated, and referred to *sedakovii* as a variety, is quite distinct; and, whilst the side-processes of the tegumen and the smallness of the extremity of the clasp place it in this section, the general form of the clasp has considerably greater resemblance to that of the next group. It has the flat, striated, truncate side-processes of the tegumen, very much as in *E. æthiops*; the clasp is quite a fifth shorter than in *æthiops*. The combined lobe and head are less than a fourth of the total length of the clasp. There is a short interval between the lobe and head without styles, which are larger than in *æthiops*, and on the lobe are large enough to suggest the *glacialis* group (IV). There are also some styles on the body or shaft.

Group IV. The typical clasp of this group is that of *E. glacialis*, with the great triangular shoulder set at right angles to the very similar head, and the armature of very strong styles. In addition to the more typical *glacialis* and its immediate allies, I think *E. tyndarus* and *epistygne* are more immediately related to this group than to any other; so I place them here, to avoid the multiplication of groups, the only alternative being to make a separate group for each of these.

This group would therefore contain—

a. 1. *mnestra.* 2. *gorgone.* 3. *gorge.* 4. *glacialis.*
b. 1. *tyndarus.* 2. *ottomana.*
c. 1. *epistygne.*

This would not be connected with group I through the two preceding groups, but more immediately, and therefore I place first, as being a more intermediate species than the others:—

a. 1. *E. mnestra* (Fig. 19). In the clasp of this species, the head and shoulder are well separated, though a little approximated as compared with *manto*, and each tends to have much the same outline as the other, though at right angles to it. There are some styles along the side of the lobe, reaching on to the body; these rarely occur in *E. glacialis* or *gorge*, nor are the styles so large and bold as in those species.

2. *E. gorgone* (Fig. 20). This has hitherto been held to be a variety of *gorge*, of which it looks like a

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large form; if it is a variety of anything, it is a variety of *E. mnestra*. The clasp does not altogether negative such a hypothesis; indeed, it rather suggests it. *E. gorgone* has a clasp triflingly larger than in *E. mnestra*; the neck is a little longer, but with no approach to the great length in *gorge*. The styles range further along the body, and these styles on the body are stronger than those in *mnestra*; the lobe is narrower and has fewer and much larger styles than in *mnestra*, and therefore looks more long and pointed than in that species. But in all these respects it is separate from *E. mnestra* only in a degree, and that so small, that I should expect to meet with forms very like it indeed in a long series of *mnestra*, these all being points in which *mnestra* is very variable.

3. *E. gorge* (Fig. 21). In *E. gorge* and *glacialis* there are no styles to the basal side of the lobe, and the styles are large. *E. gorge* is smaller, but the lobe and head are proportionally much longer. *E. triopes* is identical.

4. *E. glacialis* (Fig. 22). The clasp is very like that of *E. gorge*, but is much larger and bolder, with shorter lobe and neck.

The average dimensions of these clasps in millimetres are as follows:

	Length of Clasp.	Length of Head and Neck.	Proportion.
Mnestra . . .	1·8	·28	·16
Gorgone . . .	2·1	·44	·21
Gorge	2 5	·84	·34
Glacialis . .	2·8	·8	·28

b. The probable relation of this portion of the group to the preceding is very evident when the clasp of *E. ottomana* is compared with those of division *a*; it is not so apparent when that of *E. tyndarus* is compared, still less so if the American form *callias* is considered. The whole group consists of *E. tyndarus* and its recognised varieties, of which *ottomana* seems to me to merit specific recognition, and the American form *callias* almost to do so.

1. *E. ottomana* (Fig. 23). In this we have a well-developed form that enables us more easily to understand the others. The clasp of *ottomana* may be

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described as if it were a member of the *glacialis* group; it has a rather broad body, without styles. The lobe is prominent, triangular, and ends in one very large style. The neck and head are about one-fourth of the clasp in length; in the curve from the lobe to the head are from two to four very large styles, and the head terminates in a bundle of moderate-sized styles.

2. *E. tyndarus* (Fig. 24). This, in its best-developed form, and the one that approaches nearest to *ottomana*, has only three large styles, of which the first probably represents the lobe and is sometimes on a slight eminence, but often so slight that the three styles appear to be seated on a uniform sweep or curve reaching from the base to the head. The head has no styles, but has a rounded termination, carrying a fascicle of strong hairs. Sometimes the first two styles are conjoined. In var. *sibirica* there are only two followed by some very fine teeth. In var. *callias*, the spine representing the lobe is usually recognisable but is close down to the head, which has at its upper margin a number of styles, and below has the same rounded end as in typical *tyndarus*. The amount of variation in both European and American *tyndarus* is so great, and so much bridges over the differences, that I do not think *callias* can be recognised as distinct, but it is certainly very nearly so. *Ottomana* is in a different position, as, besides the pronounced projection of the lobe and the great number of large styles, there is a real structural difference in the presence of the styles at the extremity of the head. It has also not only a much larger, but a proportionally longer central process to the sickle. It is also much larger. The Spanish forms, *hispana* and *pyrenaica*, do not differ from the Central-European forms.

The dimensions and proportions, as given in the last group, are in millimetres as follows:

	Length of Clasp.	Length of Head and Neck.	Proportion.
Tyndarus, Carinthia .	1·44	·40	·28
„ Switzerland.	1·44	·20	·14
„ var. *sibirica*.	1·45	·30	·21
„ var. *callias* .	1·40	·10	·07
Ottomana	2·00	·48	·24
Epistygne	2·00	·40	·20

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c. *E. epistygne* (Fig. 25). This species has the processes of the sickle rather short and thick; the clasp resembles that of *tyndarus* in having very few and very large styles. There is often a trace of styles along the body, which does not, I think, occur in the *tyndarus* group. The lobe is represented by one large style, which may have one or more small styles on its sloping sides. There may or may not be a style, if so, a large one, between the lobe and head; the head terminates in from two to four very large porrected styles. Both sickle and styles are large and massive.

GROUP V. This is marked by having the neck much elongated, agreeing in this with the next group, and varying therefore from the *manto* form in precisely the contrary direction to group II and especially group III. The line of descent (or ascent), or, to avoid theory as to which is the central form, the connecting link, is in some such form as *gorge* in group IV. In the present group the neck is not only long but free from styles, whilst there is usually no difficulty in placing the lobe, though it may be reduced and free from styles. In group VI the neck has styles, and the lobe is difficult to locate. I place in this group *a. neoridas, margarita, zapateri; b. pronoe scipio, lefebvrei; c. nerine, goante, stygne, œme; d. lappona.*

a. 1. *E. neoridas* (Fig. 26). At the threshold of this group we meet a difficulty nearly as great as and of a similar kind to that in group I, viz., the distinction, if any, between the appendages of *E. neoridas* and *E. pronoe.* There is certainly no difficulty in separating the flies, although there is a close resemblance between the patterns of the underside of the hindwings.

The clasps and sickles seem to be identical. There is this difference in the styles of a considerable proportion of specimens, that *neoridas* has the lobe represented by one prominent, large, rather porrected style, with some rather inconsiderable styles, basal to it and at an interval. *Pronoe* rather has this first large style broken down into a little group, and the basal series are rather larger and of similar size and importance to the other group. But the variations certainly overlap. I may easily be wrong, but I think this is one of the instances where the identity (or nearly so) of the appendages does not justify our denying the distinctness of the species.

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2. *E. margarita.* I have had no opportunity of examining this form; it is certainly very close to *neoridas.*

3. *E. zapateri* (Fig. 27). This is a derivative of *neoridas,* but is quite distinct. The shoulder, though represented by a prominence, is quite devoid of styles and the neck is extremely slender, and, being as long as in *neoridas,* has the appearance of great length.

b. 1. *E. pronoe* (Fig. 28). When the appendages are so much alike, and when we cannot separate *neoridas* from *pronoe* by them, it may appear presumptuous to say that *E. pitho, almangoviae,* &c., are the same as *pronoe.* Still this is, I think, justified, as all these forms are not sufficiently distinct to deserve specific rank, unless it be clearly shown by the appendages to exist; whereas the reverse is the case.

2. *E. scipio* (Fig. 29). This appears to be a derivative of *E. pronoe*; the clasp is rather more massive, and the shoulder is represented by a decided sharp triangular projection ending in a double spine, with further spines along the margin towards the base and, in one specimen, with a few spines along the neck, an exception to the rule in the group.

3. *E. lefebvrei* (Fig. 30). This species appears to be a variant from *E. pronoe.* The clasp is extremely variable in the development of the shoulder and its styles, and some of the forms are quite indistinguishable from those of *pronoe*; others are close to *scipio* in form. In none do the forms go beyond what one might expect to meet with in a long series of *pronoe.*

In his able discussion of *E. melas,* Calberla does not handle this point more than is necessary to show that the Campiglio variety is abundantly distinct from this species, nor does he do much more with *melas* from Eastern Europe.

In doing this, he has done what he set out to do, namely, to prove that *melas* from Campiglio is *E. glacialis,* var. *alecto*; and further than this, he shows that *melas* from Eastern and *melas* from Western Europe are two distinct species and are neither of them *glacialis.*

E. lefebvrei (Western *melas*) is certainly very close to *pronoe,* especially in its clasp forms, but must, I think, be sustained as distinct.

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The *pronoe-neoridas* section are then all very closely allied, whether we make them all one species or several. Whilst recognising their close association, I should with my present knowledge sustain *neoridas*, *zapateri*, *pronoe*, *scipio*, *lefebvrei* as good species.

c. 1. *E. nerine* (Fig. 31). In *E. nerine* the shoulder is represented by a single spine, which is sometimes wanting, and thus it is easily distinguished from any member of the *pronoe* group. The Eastern *melas* (true *melas ?*) is a form of *nerine*. The clasps figured by Calberla, and those I have examined, are precisely identical with those of *nerine*. That this is here proof of specific identity follows from the fact, that *E. nerine* in its easterly distribution has a well-recognised variety *morula*, of which many specimens are very close to *melas*. A few years ago I took at Cortina a specimen of *E. nerine*, that would be difficult to distinguish from *melas*. This and other dark specimens were, like *melas*, smaller than the *nerine* with which they flew, but with intermediate forms showing their identity. It seems that eastwards *E. nerine* becomes smaller and darker till it presents no normally coloured specimens and is then in fact *melas*.

2. *E. goante* (Fig. 32). This is a very distinct species, the clasp being not unlike that of *nerine*, but broader and more robust seen from above or within; seen laterally, the neck tapers steadily to the head, whilst in *nerine* it preserves its width more nearly throughout. *E. goante* is without any representative of the lobe or shoulder. *E. nerine* usually but not always has a solitary spine or style.

3. *E. stygne* (Fig. 33). In lateral view the clasp is shorter and more robust than that of *E. goante*, narrowing very much just at the neck, expanding very much towards the head and having the terminal style very large.

4. *E. œme* (Fig. 34). This has a clasp not unlike that of *E. stygne*. If we suppose the neck in *stygne*, instead of expanding again, to continue tapering and to terminate in a single large claw-like style, we should have the form in *œme*. This clasp with a solitary terminal style is very distinctive, occurring in no other *Erebia*. though forms very close to it occur in other genera,

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E. œme may therefore be easily distinguished by this character, a useful fact, since some of its varieties closely resemble other species. I have found it mixed with *E. medusa* and *E. manto.*

5. *E. lappona* (Fig. 35). The clasp hardly looks like, or answers to the description of, those of the leading species of this group—yet it seems to come here most naturally, since it has essentially the same structure, but is so much shortened and broadened as to make it almost as short and squat as that of *E. afra*, which it considerably resembles. It has no recognisable shoulder, the neck is broad and flat, and there is a row of styles at the extremity. Though so broad, it is thin, or at least the neck is, so that, seen laterally, its outline is not unlike that in *E. œme*, and, though so abbreviated, it really possesses the characters of this group.

Group VI. This group, except perhaps as regards *E. evias*, is not very close to group V, but it agrees in having a long clasp, with a long neck. This is cylindrical with a terminal cap of styles; the position of the lobe is not very obvious and there is usually an armature of styles stretching along the neck and shaft.

The species here included fall into three divisions, each of which is probably so distinct as to be of equal value with group V. In fact, this group might very properly be made into three groups.

The species are: *a. evias*;
b. rossii (*ero*);
c. embla, cyclopius, disa.

a. *E. evias* (Fig. 36). A rather isolated form, in which the typical neuration is for veins 10 and 7 to arise together. This tendency to incline to Section B. probably does not imply any relationship to the forms in that section; the facies of this species is very different, and is much that of group V; besides, the clasp form has nothing approaching it in the whole of Section B, though the large area of numerous styles is not without a suggestion of some species there. The form of the clasp is that of this group or nearly so, but the spines (or styles) are very minute, especially on the head, and extend thence as a broad band, of a number of rows, towards the base, past the position that probably represents the lobe.

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b. *E. rossii* (Fig. 37). This is identical with *E. ero*. The clasp is very like that in the following division, but with a remarkable zigzag bend in the middle; it has the head clothed with quite a helmet of spines, as in *E. hewitsonii*. The sickle, however, at once distinguishes it, the side-processes being of the ordinary form. I have had the advantage of seeing the appendages of the type specimen, temporarily in Mr. Elwes' possession.

c. The next three forms are very close together, having very similar clasps and very similar tegumina (sickles) with the lateral processes expanded into racket-shaped ends. So close are they that at first I thought they were probably forms of one species, and I am not certain that that may not ultimately prove to be the case; they are at any rate well-marked local forms, and must for the present at least be regarded as good species.

The upper surface of *E. embla* and *cyclopius* varies to forms that are almost identical; I have not seen forms intermediate as to the lower surface—still *cyclopius* has a pale band, whose outline may be detected in *embla*, where the pale colour has dwindled to two spots. Intermediate forms, and so-called hybrids between *embla* and *disa*, also occur. *E. cyclopius* is unrelated to *E. edda* or the *Callerebiæ*, which it much resembles in wing pattern.

1. *E. embla* (Fig. 38). This form has much the longest clasp, as 6 to 5 in *disa* and *cyclopius*, with very large spines which run but a short way along the neck.

2. *E. cyclopius* (Fig. 39). This has a rather shorter clasp, as 5 to 6; the spines are rather smaller and run more than half way to the base.

3. *E. disa* (Fig. 40). This clasp is much like that of *cyclopius*, but is shorter and thicker throughout.

Group VII. *E. medusa*, *E. hewitsonii*.

1. *E. medusa* (Fig. 41). In some respects this would come near *E. stygne*, especially in view of the form of clasp found in some German specimens I have. They exhibit a distinct neck, slightly curved, and carrying a rounded head with a circuit of spines. I hardly think these specimens represent a form entitled to specific rank,

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but they give the clue to the real nature of the appendages of *medusa*; since in them the resemblance to those of *stygne* is considerable, whilst the ordinary form of clasp in *medusa* is more simple. The open side comes close to the head, which has but a few styles along its upper margin and looks as if it would like to be rid of them; the lower portion of the head is rounded as in *tyndarus*, the whole style being straight. We find, however, that the butterfly has much superficial resemblance to *E. hewitsonii*, and that these two species agree in having Asiatic neuration (10 out of 7) rarely in the male, not unfrequently in the female, and are therefore clearly intermediate between Sections A and B.

2. *E. hewitsonii* (Fig. 42) agrees with *medusa* very much in its facies and also in its neuration. The tegumen is much larger and bolder, as 3 to 2. The clasp has much the same general form, the open side extending close up to the head, which however is much larger, set at a considerable curve to the body and clothed with quite a helmet of large styles. In these respects it resembles the forms found in Section B rather than those of Section A.

SECTION B.

We have already seen that the neuration characteristic of this section occurs in Section A, in *E. evias*, which has probably no relationship with Section B, and in *E. medusa*, which possibly is related to a portion of Section B, and *E. hewitsonii*, which I should have placed in B, but for its apparent connexion with *medusa*.

Some species in Section B have the characteristic venation in no greater degree than *medusa* has, 10 sometimes arising from 7 and sometimes not, whilst in others 10 arises so far along 7 that it can hardly ever be separated from it even in extreme varieties.

I desire, so far as is reasonable, to give especial weight to the indications afforded by the appendages, and therefore perhaps I incline to note the value of neuration when it confirms them, and to neglect it when it does not accord; and so here I do not follow the neuration altogether, but rather the clasp indications. It may therefore be well to give precisely the neurations observed.

In the great mass of the European Section veins 6, 7 and

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10, arise abundantly apart from each other. Still in occasional specimens 7 and 10 arise very close together; thus in one specimen of *E. æthiops* and two of *epiphron*, they arise together but immediately separate. In *E. evias* as a rule they arise apparently close together. A specimen of *E. gorge* has 6 rising out of 7, and so forth.

Then in *E. medusa* the majority of examples appear to have 10 well separate from 7, but in not a few 10 arises out of 7, and even some little distance along it.

A similar condition obtains in *E. hewitsonii*, *epispodea*, *sibo* (*ocnus*), *radians*, *kalmuka* and *meta*. In these the European neuration is less frequent than in *E. medusa*, and not unfrequently 10 rises a good way along 7. In the female this is much more usually the case, and 6 also often rises out of 7.

In *E. turanica*, *edda*, *tristis*, *dabanensis*, *tundra*, *discoidalis*, *fasciata*, *parmenio*, *afra*, 10 always rises a good way along 7.

Yet by clasp form *E. medusa* is not so near to any of these as they are to each other, and the above from *E. epispodea* to *discoidalis* belong to one group. *E. hewitsonii* and *fasciata*, *E. afra* and *parmenio* are different, each species almost forming a group by itself.

Section B may therefore be divided into two parts by the venation, a division with venation varying between the European and Asiatic type and a division with purely Asiatic venation. It may also be divided into two by possessing the clasps (1) with some resemblance to those of group II. in outline, (2) of other forms.

Group VIII. There is a considerable sameness of the clasp form throughout the group, which is thus a very natural one; the variation is from a type generally resembling that of group II, but with little indication of a division of the style-bearing margin into head and lobe, and with this margin occurring as an oblique truncation of the shaft in the lobe region, and the head and neck abbreviated. See remarks under Group II.

1. *E. epispodea* (Fig. 43). The clasp of this species most resembles the form found in group II; the body is curved forwards so that the style-covered margin is parallel to its axis, or nearly so. There is some variation, especially in the size of the styles, which are in several rows.

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2. *E. meta* (Fig. 44). This species has rather slender lateral processes to the tegumen. The styles do not end so abruptly upwards as in other species, but pass on to the body, dwindling in size. There are some little differences in the size of the styles and their lateral extension in different specimens, which I have under the names *yssica, gertha, mopsos, alexandra,* but they are not sufficient to warrant definition. I fancy larger series would show such slight differences to be individual to a great extent.

3. *E. sibo* (Fig. 45). This has the lateral processes of the tegumen very short and small, incurved and adpressed, so as to be very inconspicuous. The clasp has a little trace of depression before the tip (site of neck ?); styles of moderate size in several rows.

3 *a*. *E. ocnus*. It has the same tegumen as *sibo*, which is quite a distinctive one. The styles are rather bolder and the one at the extremity of the clasp is very large. As five preparations of my own, and one or two of Mr. Elwes's preparations, are all I have seen of the two species, I do not like to be positive, but incline to regard the differences observed between *sibo* and *ocnus* as individual variations; I should unite the species, if this is at all in agreement with other indications.

4. *E. kalmuka* (Fig. 46). This species comes nearest to *E. sibo* in the form of the tegumen; the clasp is smaller, with bolder styles in definite alternate rows, the front one incurved. Despite its peculiar facies, both the appendages and neuration show this to be the natural position of the species.

5. *E. radians* (Fig. 47). I have already referred to the cylindrical S-shaped shafts and hemispherical ends of the lateral processes of the tegumen, that distinguish this species. The styles are large and bold, there is a depression in the stylous ridge possibly representing the neck.

6. *E. turanica* (Fig. 48). This very closely resembles *E. meta* especially in the form of the tegumen, and in the styles invading the shaft of the clasp, which is however smaller, more delicate apically and more rounded.

7. *E. edda* (Fig. 49). The central process of the tegumen is rather long; the clasp resembles that of

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radians in showing indications of a neck, when seen in profile; but when looked down upon, on the style-bearing surface, it is very broad, especially towards the head, and has seven or eight rows of styles, which are very small towards the head; the stylous ridge is easily twisted in getting into position for observation.

8. *E. tristis* (Fig. 50). One may describe the clasp of this form as having acquired permanently and with much exaggeration a peculiar twist, such as the stylous ridge of *edda* easily falls into in a trifling degree, but so exaggerated as to be almost different in kind, though difficult to describe.

9. *E. dabanensis* (Fig. 51). The tegumen is very large, especially the central process; the clasp has the general form of that of *epispodea*, but is larger and stronger, and with the stylous ridge twice as long. The styles are very large and bold, in several rows, curling over and especially overhanging their base towards the body.

10. *E. tundra* (Fig. 51 *bis*). The facies of this species is very much that of *E. meta*, but it is probably nearer *dabanensis*. In Dr. Standinger's two original specimens the neuration is Asiatic and, especially in the male, 10 arises very far along 7. The appendages in the male specimen happen to be well expanded, and are capable of being examined fairly satisfactorily *in situ*, but cannot be so easily sketched under the camera as if removed; the processes of the tegumen are long, and the lateral ones very sharp and slender. The form of the clasp is almost identical with that of *dabanensis*, but the spines are not so bold and pronounced, nearer in fact to those of *meta*, and are in a double row.

11. *E. discoidalis* (Fig. 52). The central process of the tegumen is large and heavy, not unlike that of *E. hewitsonii*; the stylous surface of the clasp is more terminal and less marginal than in others of this group, and passes round the head, suggesting an alliance with *E. hewitsonii* or *E. fasciata*.

Group IX. 1. *E. fasciata* (Fig. 53). This has a very large, broad, rounded clasp, with a heavy armature of large styles surrounding the end. The form of the clasp may perhaps be derived from that of group VIII. by way of

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discoidalis, but it has a very special and distinctive aspect, so that its absolute identity in *fasciata*, *erinna*, and *magdalina* leaves no doubt that these are all forms of one species—a conclusion that is not disturbed by any observable differences in them, when once their identity is asserted.

2. *E. parmenio* (Fig. 54). This form has probably little in common with the last species; it has a peculiarly broad square, squat clasp.

3. *E. afra* (Fig. 55). Another short, broad, squat clasp, which is however not of the same character as that of *parmenio*; in outline on lateral view, it is not unlike that of *œme* or *lappona*, and if we could assume Asiatic neuration to be independently acquired, the species might be placed on its clasp form near *lappona*. The great size and length however of the upper process of the tegumen make this hypothesis untenable.

The three species in this group ought perhaps to have been placed each in a separate group, as they have not much in common.

I place by itself *E. myops* (Fig. 56), whose right to be regarded as an *Erebia* I disallow. The form of the tegumen suggests an alliance with *Cœnonympha*.

Another group that are not Erebias but are well on the way to *Callerebia*, are *maracandica* (Fig. 57), *jordana* (Fig. 58), *hades* (Fig. 59) and one or two other named forms. Their appendages are more like those of *Callerebia* than of *Erebia*, and their facies is different.

Herse (Fig. 60) is another species, with a very remarkable clasp form, that seems not to be an *Erebia*.

By showing the identity of *erinna*, *fasciata*, and *magdalina*, there is demonstrated a parallel to the case of *glacialis* even closer than that which the similarity of *magdalina* in so many respects to var. *pluto*, had led Mr. Elwes and others to draw. In showing also the identity of *melas* with *nerine*, and the close relationship though probably not specific identity of *pronoe* and *lefebvrei*, I enlarge the number of examples in which geographical isolation has had the effect of establishing very marked varieties or incipient species, varieties that often differ more than distinct species do; yet, geographical isolation only having operated, the form of the appendages remain unchanged and the species may remain

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undivided whilst in other cases the divergence has reached specific distinction.

Perhaps the best known example of this is *E. glacialis*, which in its varied forms of *alecto*, *pluto*, *nicholli*, has been regarded as forming several distinct species, but is now accepted as being really only one variable species—a conclusion fully borne out by the identity of the appendages in all the forms, and probably more readily accepted as the geographical area it inhabits is not a very wide one.

As being perhaps at the other end of the series, in so far as the extreme forms are entitled to, and will doubtless be accorded, specific rank, we may take the group of *E. neoridas*, *margarita*, *zapateri*; *margarita* I have not had the opportunity of examining, but *neoridas* and *zapateri* are obviously very closely allied, and the appendages show that *zapateri*, though quite a distinct form, is very close indeed to *neoridas*.

These two instances, perhaps the most familiar, and also the most extreme as regards the identity or distinctness of the forms composing them, are not by any means the most typical and remarkable, in as much as their component elements are not very widely separated geographically.

The *æthiops* group consists of *E. æthiops*, inhabiting Europe, *E. sedakovii*, Asia, and *E. niphonica*, Japan. The close resemblance of these three and other named forms and the identity of their appendages, compel one to the conclusion that they are geographical varieties not entitled to specific rank.

Perhaps the most interesting species in this connexion is *E. fasciata* from Asia, which is identical specifically with *erinna* from Asia and *magdalina* from Colorado. Their appendages differ *toto cælo* from those of *glacialis*, as does the neuration, yet *magdalina* in appearance (and Mr. Elwes tells me in habits and habitat also) might be mistaken for *glacialis*, var. *pluto*, and *erinna* for *glacialis*, type.

E. nerine is of much interest, being modified into a small dark variety which has been called *morula*, in its more eastern range, and still further south and east recognised as a distinct species under the name of *melas*.

We may contrast with these the *manto*, or grass Erebiar group, consisting of nine species, of which eight all occur

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on the Alps of Central Europe, and, except one or two species in the Pyrenees, have no wider range. Two, three, or more of the species are often, indeed usually, associated on the same ground; yet, in spite of what has been advanced as to their crossing and presenting intermediate forms, the evidence of the clasps is quite to the contrary, especially since the species said to be mixed are those that are most distinct. But all these species are sufficiently closely allied to lead us to conclude that they have a common origin; and they therefore compel us to accept in explanation Romanes's theory of physiological isolation to account for their origin and preservation as distinct species. We have then in the grass Erebias a number of very similar and associated forms with very definitely distinct appendages; whilst in the other series of species, when geographical isolation has been chiefly at work, we have slightly different forms with identical appendages that compel us to regard them as one species.

We further find that many species have dark or black forms:—*glacialis, pluto*; *fasciata, magdalina*; *nerine, melas*; *manto, cæcilia*; whilst *æme, mnestra, epiphron, stygne*, and others have forms making a very close approach to these. *E. lefebvrei* has its coloured and dark forms, and *E. cæcilia* from the Pyrenees, which appears to require a fresh name, is the only dark form not correlated with a normal coloured type.

Explanation of Plates V—XVI.

The figures are all sketched under the camera lucida, the amplification being 16 diameters.

Allowing for some roughness in the sketches, the general form of the processes of the tegumen and of the clasps, and the arrangement of the spines or styles are quite accurate.

The view of the clasps is usually lateral, but in some instances a more vertical aspect is given, to illustrate the form of the clasp. In a few cases the clasps are flattened by pressure, so that they look broader than they actually are. This gives, however, a more accurate single view of the form of the chitin, but many clasps do not admit of it.

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The indications of the articulated base of the clasps and the open (*i. e.* unchitinised) side are sketchy and only of use as showing the angle at which the clasp is viewed; a slightly different angle alters the outline of these so much, that only with elaborate drawings could their real differences be shown.

The same remarks apply to the tegumina, some differences in the figures are due to different angles of view, and in certain cases to the preparation being in some degree under pressure; these rarely prevent a due comparison of lengths, curves, sharpnesses, &c., of the processes.

The name of a locality after the description of a figure indicates that the specimen figured was obtained at that place, after the name of a species or variety, that all the examples thereof figured were obtained there.

Where preparations have been figured from a single example, the descriptions of them are separated by commas only, where from different examples of the same species or variety, by semicolons.

Plate V.

Fig. 1. *E. ligea.* *a*, tegumen, *b*, clasp (Wolfsberg, Carinthia); *c*, clasp (Norway, *Elwes*). Var. *adyta*, *d*, clasp (Norway. *Elwes*). Var. *ajanensis*, *e*, clasp (Nikolaiefsk, *Elwes*), Var.— ?, *f*, clasp. Var. *ajanensis*, *g* and *h*, clasps.

„ 2. *E. euryale.* *a*, tegumen, *b* and *c*, clasps (Lölling, Carinthia.) The view of *c* is slightly from above and shows the styles not to be in one row as they appear when seen laterally). Var. *ocellaris* (Heiligenblut), *d*, clasp, *e*, tegumen, flattened from above to show the breadth of its side processes; *f*, clasp.

„ 3. *E. cœcilia?*, (Pyrenees). *a*, tegumen (the side-processes with wide ends as in Group I. *a*), *b* and *c*, clasps; *d*, clasp.

„ 4. *E. vidleri*, *a*, tegumen, *b* and *c*, clasp (*Elwes*).

Plate VI.

„ 5. *E. manto.* *a*, tegumen, *b* and *c*, clasps: *d*, clasp; *e* and *f*, clasps (all from St. Anton, Arlberg); *g* and *h*, *clasps* (*Elwes*). Var. *pyrrhula* (Albula), *i*, tegumen, *j*, clasps; *k* and *l*, clasps.

„ 6. *E. eriphyle*, *a*, tegumen, *b*, clasp (St. Anton); *c*, clasp (Sau Alpe); *d* and *e*, clasps (Sau Alpe); *f* and *g*, clasps (example sent as var. *pyrrhula*).

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PLATE VII.

Fig. 7. *E. epiphron.* *c*, clasp (Chamonix); *d*, clasp (Germany). Var. *cassiope* (Sau Alpe), *a*, tegumen, *b*, clasp, somewhat flattened. Var. *nelamus* (Campfer, Engadine), *e*, tegumen, *f*, clasp; *g*, clasp.

„ 8. *E. pharte.* *a*, tegumen, *b*, clasp, somewhat flattened out (Kor Alp); *c*, clasps, somewhat flattened out (Col de Lauteret); *d* and *e*, clasp (Innsbrück); *f* and *g*, clasp (St. Anton). *Pharte?*, *k* and *l*, clasps (sent as var. *pyrrhula* from Switzerland).

„ 9. *E. melampus.* *a*, tegumen, *b*, clasp (St. Anton); *c* and *d*, clasps (Lauteret). Var. *sudetica*, *e*, clasp.

PLATE VIII.

„ 10. *E. arete* (Sau Alpe). *a*, tegumen, *b*, clasp, flattened; *c*, clasp.

„ 11. *E. christi.* *a*, tegumen, *d* and *e*, clasps; *b* and *c*, clasps.

„ 12. *E. kefersteini.* *a*, tegumen, *b*, clasp, *c*, clasp; *d*, clasp.

„ 13. *E. flavofasciata.* *a*, tegumen, *b*, clasp, flattened, *c*, clasp (Engadine); *d* and *e*, clasps (Campolungo).

PLATE IX.

„ 14. *E. ceto.* *a*, tegumen, *b* and *c*, clasps.

„ 15. *E. maurisius.* *a*, tegumen, *b*, clasp; *c*, clasp. Var. *haberhaueri*, *d*, tegumen, *e*, clasp.

„ 16. *E. pawlowskyi.* *a*, tegumen, *b* and *c*, clasps; *d*, clasp. Var. *ethela*, *e*, tegumen, ; *f* and *g*, clasps. Var *theano*, *h*, tegumen, *j* and *k*, clasps.

„ 17. *E. æthiops.* *a*, tegumen (Innsbrück); *b* and *c*, clasps, (Innsbrück); *d*, clasp (Argyll).

PLATE X.

„ 17. *E. æthiops*, var. *melusina*, *e*, clasp. Var. *sedakovii*, *f*, tegumen, *g*, clasp. Var. *niphonica*, *h*, clasp.

„ 18. *E. alcmena.* *a*, tegumen, *b*, clasp.

„ 19. *E. mnestra.* *a*, tegumen, *b*, clasp.

„ 20. *E. gorgone.* *a*, tegumen, *b* and *c*, clasps; *d* and *e*, clasps.

„ 21. *E. gorge.* *a*, tegumen, *b*, clasp (Innsbrück). Var. *tricpes*, *c*. clasp (Tyrol).

„ 22. *E. glacialis.* *a*, tegumen, *b* and *c*, clasps (Innsbrück).

„ 23. *E. ottomana.* *a*, tegumen, *b*, clasp; *c* and *d*, clasps.

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PLATE XI.

Fig. 24. *E. tyndarus*. *a*, tegumen, *b* and *c*, clasps (St. Anton); *d*, clasp (Switzerland). Var. *sibirica*, *e*, clasp. Var. *callias*, *j*, tegumen; *g* and *h*, clasps; *f* and *k*, clasps.

„ 25. *E. epistygne*. *a*. tegumen, *b*, clasp (Digne); *c*, clasp (Grasse).

„ 26. *E. neoridas*. *a*. tegumen, *b*, clasp; *c*, clasp.

„ 27. *E. zapateri*. *a*, tegumen, *b*, clasp.

„ 28. *E. pronoe*. *a*, tegumen; *b* and *c*, clasps (St. Anton).

PLATE XII.

„ 29. *E. scipio* (Digne). *a*, tegumen, *b*, clasp; *c*, clasp.

„ 30. *E. lefebvrei*. *a*, tegumen, *b*, clasp; *c*, clasp; *d*, clasp; *e* and *f*, clasps.

„ 31. *E. nerine*. *a*, tegumen (Mendel Pass); *b*, clasp (Cortina); *c*, clasp (Istria). Var. *morula*, *d*, clasp; *e*, clasp. Var. *melas*, *f*, clasp (Herculesbad); *g*, clasp (Greece); *h*, clasp (do.).

„ 32. *E. goante*. *a*, tegumen, *b* a n *c*, clasps.

PLATE XIII.

„ 33. *E. stygne*. *a*, tegumen, somewhat from beneath, *b*, and *c*, clasps. Var. *pyrenaica*, *d*, clasp.

„ 34. *E. æme*. *a*, tegumen, *b*, clasp; *c*, clasp.

„ 35. *E. lappona*. *a*, tegumen, *b*, clasp (top view), *c*, clasp, (lateral view).

„ 36. *E. evias*. *a*, tegumen, *b*, clasp.

„ 37. *E. rossii*. *a*, tegumen. Var. *ero*, *b*, clasp; *c*, clasp, *d*, end of clasp more enlarged.

„ 38. *E. embla*. *a*, tegumen, *b*, clasp, *c*, end of clasp.

„ 39. *E. cyclopius*. *a*, tegumen, *b* and *c*, clasps.

PLATE XIV.

„ 40. *E. disa*. *a*, tegumen, *b*, clasp.

„ 41. *E. medusa*. *a*, tegumen, *b*, clasp (Germany); *c*, clasp (Lölling). Var. *polaris*, *d*, clasp. Var. *transiens*, *e*, clasp. Var. *hippomedusa*, *f*, clasp.

„ 42. *E. hewitsoni*. *a*, tegumen, *b* and *c*, clasps.

„ 43. *E. epipsodea*. *a*, tegumen, *b*, clasp; *c*, clasp viewed more laterally.

„ 44. *E. meta*, var. *yssica*. *a*, tegumen, *b* and *c*, clasps.

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Fig. 45. *E. sibo*, *a*, tegumen, *b* and *c*, clasps.
„ „ *E. ocnus*. *d* and *e*, tegumen ; *f*, clasp ; *g*, clasp.

PLATE XV.

„ 46. *E. kalmuka*. *a*, tegumen, *b*, clasp.
„ 47. *E. radians*. *a*, tegumen, *b* and *c*, clasps.
„ 48. *E. turanica*. *a*, tegumen, *b* and *c*, clasps.
„ 49. *E. edda*. *a*, tegumen, *b*, clasp, edge view, *c*, clasp, side view.
„ 50. *E. tristis*. *a*, tegumen, *b* and *c*, clasps.
„ 51. *E. dabanensis*. *a*, tegumen, *b* and *c*, clasps.
„ 51*. *E. tundra*. *a* and *b* (somewhat foreshortened), clasp.
„ 52. *E. discoidalis*. *a*, tegumen, *b*, clasp ; *c*, clasp, viewed at a different angle ; *d* clasp (*Elwes*).

PLATE XVI.

„ 53. *E. fasciata*. *c*, clasp (*Mus. Brit.*). Var. *magdalina*, *a*, tegumen, *b*, clasp. Var. *erinna*, *d*, clasp.
„ 54. *E. parmenio*. *a*, tegumen, *b*, clasp.
„ 55. *E. afra*. *a*, tegumen, *b*, clasp, top view, *c*, clasp, side view. Var. *dalmata*, *d*, clasp.[1]
„ 56. *E. myops*. *a*, tegumen, *b*, clasp.
„ 57. *E. maracandica*. *a*, tegumen, *b*, clasp.
„ 58. *E. jordana*. *a*, tegumen, *b*, clasp.
„ 59. *E. hades*. *a*, tegumen, *b*, clasp.
„ 60. *E. herse*. *a*, tegumen, *b*, clasp.

[1] A most difficult clasp to represent satisfactorily.

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XIV. *The Moths of the Lesser Antilles.* By Sir George F. Hampson, Bart., B.A.

[Read June 1st, 1898.]

Plate XVII.

In a former paper * I gave an account of the moths belonging to the families *Epiplemidæ*, *Geometridæ*, *Pyralidæ* and *Sesiadæ* collected in the Lesser Antilles, chiefly St. Vincent and Grenada, by Mr. H. H. Smith, the account forming one of a series of papers descriptive of the insects collected on behalf of the Committee of the Royal Society and British Association appointed to explore the fauna and flora of the smaller West Indian islands. The present paper deals with all the other families of moths except the *Pterophoridæ*, *Tortricidæ* and *Tineidæ*, which will be dealt with by Lord Walsingham and complete the subject; in addition to the collections of Mr. Smith those made in St. Lucia and Dominica by Mr. W. H. Eliott are recorded.

Family—SYNTOMIDÆ.

Pheia daphæna, sp. n.

♂. Head and thorax black; frons and vertex of head spotted with white; tegulæ, shoulders, and patagia with large crimson patches; fore coxæ, hind tibiæ at base, and 1st joint of tarsi white; abdomen black with two dorsal white patches on 1st segment followed by metallic green patches which extend laterally towards extremity; the 1st two segments ventrally white; wings hyaline, the veins and margins black. Forewing with crimson streaks below basal two-thirds of costa and above inner margin; a discocellular spot; the terminal band expanding very widely on apical area and below vein 2. Hindwing with the terminal band expanding widely towards apex and slightly below vein 2.

Hab. Dominica; Santa Lucia (*W. H. Eliott*). *Exp.*, 30 mill.

Antennæ of male serrate; hind tibiæ greatly dilated; forewing with vein 3 from angle of cell.

* A.M.N.H. (6), xvi, pp. 329–349 (1895).

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COSMOSOMA DEMANTRIA, Druce, A.M.N.H. (6), xv, p. 44 (1895).
Dominica.

COSMOSOMA HYPOCHEILUS, sp. n.

♂. Head black with some metallic blue on vertex; antennæ white at tips; thorax scarlet above, black below; legs with metallic blue on coxæ; abdomen orange scarlet with lateral black bands, with series of metallic blue spots on them, meeting at extremity and approximated at base of dorsum; paired black patches on ventral surface; the terminal segments black; wings hyaline, the veins and margins black. Forewing with fine scarlet streak below basal three-fourths of costa; the base scarlet emitting a short streak along inner margin; a discoidal black spot; a black patch more or less completely filling up the interspaces between veins 2 and 4; the apical area very widely black. Hindwing with some scarlet at base; a black patch in cell; the apical and inner areas black.

♀. With the black patch between veins 2 and 4 of forewing very much reduced or absent.

Hab. ST. VINCENT (Windward side). (*H. H. Smith*). *Exp.*, 30 mill.

Abdomen of male without ventral valve; hindwing with the lower part of cell normal, veins 2 and 4 rather shortly stalked.

SYNTOMEIDA SYNTOMOIDES, Boisd. Spéc. Gén. Lep., i, pl. 16, f. 4 (1836).
Santa Lucia; Dominica (*W. H. Eliott*).

EUCEREON IMRIEI, Druce, P.Z.S., 1884, p. 322, pl. 25, f. 6.
Dominica.

EUCEREON CLEMENTSI, Schaus, Am. Lep., p. 10, pl. 1, f. 25 (1892).
Santa Lucia.

Family—ARCTIADÆ.

Subfamily *ARCTIANÆ*.

HALISIDOTA PELLUCIDA, Sepp, Ins. Surin., ii, pl. 76 (1848).
St. Vincent.

PAREUCHÆTES CADAVEROSA, Grote, Proc. Ent. Soc. Phil., v, p. 245 (1865).
St. Vincent.

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ECPANTHERIA ERIDANUS, Cram., Pap. Exot., i, pl. 68, G. (1775).
Dominica.

AMMALO FERVIDUS, Wlk., iii, 622 (1855).
St. Vincent.

Subfamily *LITHOSIANÆ.*

DEIOPEIA ORNATRIX, Linn., Syst. Nat., i, p. 511 (1758): var. *pura*, Butl., Trans. Ent. Soc. Lond., 1877, p. 360.
St. Vincent.

CYDOSIA HISTRIO, Fabr., Spec. Ins., ii, 203, 139.

Phalæna nobitella, Cram., Pap. Exot., iii, 128, p. 264, G.
St. Lucia; St. Vincent; Mustique I., Grenadines.

CISTHENE POLYZONA, Druce, Biol. Centr.-Am., Het., i, p. 123, pl. 12, f. 13.
Dominica.

CISTHENE METOXIA, sp. n. (Pl. XVII, fig. 8).

Head and thorax fuscous; palpi, except 3rd joint, yellow; vertex of head and tegulæ yellow; pectus and legs yellow and fuscous; abdomen crimson, orange below; forewing fuscous; the costa and termen yellow; slight yellow streaks on subcostal and median nervures; an elongate patch on basal half of inner margin and a rounded patch at tornus. Hindwing fuscous with crimson streak below cell, in one specimen extending to beyond middle, in another with only its terminal portion present, in the 3rd quite obsolete; a crimson fascia on inner margin.

Male with the tornus produced to a pointed lobe, the inner area with a fold containing a tuft of long hair.

Hab. ST. VINCENT; GRENADA, Balthazar (*H. H. Smith*). *Exp.*, 16 mill.

PTYCHOGLENE XANTHOPLEURA, sp. n. (Pl. XVII, figs. 1, 15.)

♂. Dark brown slightly irrorated with yellow scales; sides of pectus and abdomen with orange fasciæ which almost meet above on 1st segment of abdomen. Hindwing with broad orange fascia from base to beyond cell; the inner margin orange. Underside of both wings with some orange at base.

♀. With hardly a trace of orange irroration; abdomen with the lateral fasciæ very slight. Hindwing with the fasciæ in cell and on inner margin very slight and confined to basal area.

Hab. GRENADA, Balthazar, Mount Gay. (*H. H. Smith*). *Exp.*, ♂ 30, ♀ 36 mill.

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Subfamily *NOLINÆ*.

Genus NEOSELCA, nov.

Palpi short, obliquely upturned; antennæ bipectinate with moderate branches. Forewing with the cell very long, vein 2 curved from before its middle; 3 from before angle; 4, 5 separate; 6 from upper angle; 7, 8 stalked from 10, 9 absent; 11 from cell. Hindwing with vein 2 from well before angle of cell; 3, 4 separate; 5 obsolescent from middle of discocellulars; 6, 7 stalked; 8 from middle of cell.

TYPE. *Nola minuta*, Druce. The genus will also include *N. melicerta*, Druce.

NEOSELCA MINUTA, Druce, Biol. Centr.-Am., Het., i, p. 140, pl. 13, f. 17.
Grenada—Balthazar.

HYBLÆA PUERA, Cram., Pap. Exot., pl. 103, ff. D, E.
St. Vincent (south end); Grenada—Mount Gay.

Family—NOCTUIDÆ.

Subfamily *TRIFINÆ*.

HELIOTHIS ARMIGERA, Hübn., Samml. Eur. Schmett, Noct., ii, pl. 79, f. 370.
St. Vincent.

HELIOTHIS VIRESCENS, Fabr., Ent. Syst., iii, 30, 72.
St. Vincent; Union I., Grenadines; Grenada—Mount Gay, Balthazar; St. Lucia.

AGROTIS INCIVIS, Guen., Noct., i, 274.
St. Lucia; Grenada—Balthazar, Mount Gay.

LEUCANIA SOLITA, Wlk., ix, 99.
Grenada—Mount Gay.

LEUCANIA HUMIDICOLA, Guen., Noct., i, 90.
Grenada—Mount Gay, Mount Maitland.

LEUCANIA LOREYI, Dup., Lep. Fr., iv, p. 81, pl. 105, f. 7.
St. Vincent; Grenada—Mount Gay.

EUTHISANOTIA AMARYLLIDIS, Sepp, Ins. Surin., i, 63, pl. 28.
St. Lucia; St. Vincent.

CROPIA INFUSA, Wlk., xiii, 1116.
St. Lucia.

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EUPLEXIA RESPONDENS, Wlk., xv, 1720.
St. Lucia.

EUPLEXIA CONCISA, Wlk., ix, 191.
St. Vincent.

EUPLEXIA CIRCUITA, Guen., Noct., i, p. 227.
St. Vincent (windward side); Grenada.

EUPLEXIA APAMEOIDES, Guen., Noct., i, p. 229.
Grenada—Mount Gay; St. Vincent.

EUPLEXIA SUTOR, Guen., Noct., i, p. 231.
Grenada—Balthazar; St. Vincent.

EUPLEXIA ALBIGERA, Guen., Noct., i, p. 228.
Grenada—Mount Gay; St. Vincent.
This species in the male has the palpi longer and tufted with hair on the inner side towards the extremity.

EUPLEXIA TERENS, Wlk., xi, 586.
Grenada—Balthazar, Mount Gay.

CUCULLIA ERIDANIA, Cram., Pap. Exot., pl. 358, F.
Grenada—Balthazar, Mount Gay. The variety *albula*, Wlk., occurs with the typical form in the same localities.

CUCULLIA DIMINUTA, Guen., Noct., i, p. 141.
St. Vincent.

CUCULLIA VITRINA, Wlk., xi, 718.
Grenada—Mount Gay.
This differs from typical species of *Cucullia* in being without the dorsal tufts on the abdomen and should probably be placed in a new genus.

PRODENIA COMMELINÆ, Sm., Abb. Lep. Georgia, ii, p. 189, pl. 95.
Grenada—Balthazar; St. Vincent.

ACRONYCTA ESULA, Druce, Biol. Centr.-Am., Het., i, p. 297, pl. 28, f. 1.
Grenada—Mount Gay.

CARADRINA MACRA, Guen., Noct., i, p. 157.
Grenada—Mount Gay, Balthazar.

CARADRINA EPOPEA, Cram., Pap. Exot., pl. 272, G, H.
St. Lucia; Grenada—Balthazar.

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CARADRINA SPILOMELA, Wlk., xxxii, 648.

Grenada—Mount Gay. The variety *subaquila*, Harvey, occurs with the typical form, of which *conviva*, Harvey, is a synonym.

CARADRINA EXESA, Guen., Noct., i, p. 222.

Grenada—Mount Gay; St. Vincent. Usually smaller and redder than the Florida specimens.

CARADRINA FUSCIMACULA, Grote, Bull. Geol. Surv., vi, 262.

Subsp. 1. Much more uniform rufous brown than the typical form. Forewing with the orbicular and reniform less prominent, the latter with fuscous spots in its upper and lower parts not conjoined; the lines paler with the dark edges less prominent. Hindwing fuscous with a rufous tinge and distinctly whitish towards base.

Hab. ST. VINCENT; GRENADA, Mount Gay.—VENEZUELA, Aroa; BRAZIL. *Exp.*, 26 mill.

Subsp. 2. Much more uniform dark fuscous brown than the typical form, the thorax and forewing with slight rufous tinge; the lines grey with the dark edges hardly visible; hindwing uniform fuscous.

Hab. MEXICO, Coatepec. *Exp.*, 30 mill. (1 ♂, *Coll. Schaus.*)

The male of both the above forms has the underside of both wings irregularly suffused with dark scales to the middle as in the typical form, in which it differs from *grata*, Hübn.

CARADRINA TRISTICTA, sp. n. (Pl. XVII, fig. 2.)

Palpi of male with the 2nd and 3rd joints fringed in front with short downturned hair; fore coxæ and femora thickly fringed with large scales above.

Pale yellowish rufous; vertex of head, thorax and forewing irrorated with dark scales; the scales on forelegs fulvous. Forewing with short waved fuscous sub-basal line; an antemedial fuscous line not reaching inner margin, often reduced to spots; a medial rufous line slightly angled below costa, then sinuous; three small round white spots in end of cell; a rufous postmedial line strongly angled beyond cell then sinuous; veins 5 and 6 very strongly streaked with rufous; a subterminal rufous line obtusely angled at vein 6 then incurved; a prominent terminal series of black points. Hindwing yellowish white with traces of postmedial line excurved beyond cell; some brownish terminal lunules.

Hab. HAITI; GRENADA, Mount Gay. *Exp.*, 28 mill.

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AMYNA OCTO, Guen., Noct., i, p. 233.
Grenada—Balthazar, Mount Gay.

CALLOPISTRIA FLORIDENSIS, Guen., Noct., ii, p. 292.
St. Lucia; St. Vincent.

Subfamily *ACONTIANÆ.*

CORUBATHA QUADRIFERA, Zell., Verh. Zool.-Bot. Ges. Wien., xxiv, p. 3, pl. 12, f. 2.
Grenada—Balthazar.

ATETHMIA REPANDA, Fabr., Ent. Syst., iii, 1, p. 462 (1793), *subusta,* Hübn., Zutr., ii, 205, 206.
St. Lucia; Grenada—Mount Gay.

The variety *incidens,* Wlk., occurs with the typical form.

XANTHOPTERA TIGRIS, Guen., Noct., ii, p. 317.
Grenada—Mount Gay.

XANTHOPTERA NIGROFIMBRIA, Guen., Noct., ii, p. 241.
Grenada—Balthazar, Mount Gay.

OMMATOCHILA MUNDULA, Zell., Verh. Zool.-Bot. Ges. Wien, xxii, 460, pl. 2, f. 4.
Grenada—Mount Gay.

OMMATOCHILA LATIPALPIS, Wlk., xv, 1763.
Grenada—Mount Gay.

The second joint of the palpi has very large tufts of scales on the inner side.

SPRAGUEIA TRANSMUTATA, Wlk., xxxiii, 776.
Grenada—Mount Gay.

SPRAGUEIA RUDISANA, Wlk., xxxiii, 776.
Grenada—Mount Gay.

SPRAGUEIA CANOFUSA, sp. n. (Pl. XVII, fig. 4).

Head and thorax dark brown suffused with olive grey scales; abdomen brown. Forewing dark brown suffused with olive grey scales; ill-defined whitish patches at base and middle of costa and a more prominent triangular white spot before apex; faint traces of oblique antemedial and medial lines, and of a subterminal line; an indistinct semicircular black mark beyond the cell, part of its lower edge defined by white; a fine white line on medial part of termen and a dark line through the cilia. Hindwing brown; cilia pale at tips.

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Hab. JAMAICA (*Cockerell*); HAITI; GRENADA, Mount Gay (*H. H. Smith*).—BRAZIL, São Paulo (*Jones*). *Exp.*, 16 mill.

Genus TARACHIDIA, nov.

TYPE. *T. flavibasis.*

Palpi obliquely porrect, extending just beyond frons which has a rounded prominence truncate below; antennæ minutely ciliated; abdomen without dorsal tufts. Forewing with vein 7 from angle of cell; 8, 9 stalked; 10 from cell. Hindwing with veins 3, 4 stalked; 6, 7 from upper angle.

TARACHIDIA FLAVIBASIS, sp. n. (Pl. XVII, fig. 3).

♂. Head and tegulæ grey brown; thorax olive yellow; abdomen brown. Forewing with the basal half olive yellow with oblique outer edge; the terminal half brown with some greyish suffusion. Hindwing brown; cilia pale at tips. Underside brown.

Hab. GRENADINES, Union I. (*H. H. Smith*), one ♂. *Exp.*, 20 mill.

TARACHIDIA HOLOPHÆA, sp. n. (Pl. XVII, fig. 17).

♀. Grey-brown; palpi at base, pectus and ventral surface of abdomen white. Forewing with the basal area suffused with a few long yellow scales and a few more on medial terminal area, the rest of wing irrorated with white scales. Hindwing fuscous brown; cilia white at tips. Underside greyer.

Hab. GRENADINES, Union I. (*H. H. Smith*), one ♀. *Exp.*, 20 mill

EUBLEMMA FLAMMICINCTA, Wlk., xxxiii, 801.
Grenada—Balthazar; St. Vincent.

EUBLEMMA ROSESCENS, sp. n. (Pl. XVII, fig. 9).

Head nearly pure white; antennæ yellowish and fuscous; tegulæ pale yellow; thorax and abdomen fulvous red, the latter with segmental white lines. Forewing rosy pink; the costal area yellow, narrowing to a point before apex; straight oblique rufous antemedial and medial lines, the latter diffused on inner side; the postmedial line fine, angled below costa, then sinuous; the terminal area bright rufous, expanding at middle and narrowing to apex; traces of a sinuous subterminal line with three dark points on it between veins 4 and 7. Hindwing pale yellow becoming rufous towards termen.

Hab. HAITI; ST. LUCIA; ST. VINCENT; GRENADA, Balthazar (*H. H. Smith*). *Exp.*, 22 mill.

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Subfamily *PALINDIANÆ*.

PALINDIA ADDENS, Wlk., xv, 1768.
St. Lucia.

PALINDIA MICCA, Druce, Biol. Centr.-Am., Het., i, p. 319, pl. 29, f. 22.
Grenada—Mount Gay.

Subfamily *EUTILIANÆ*.

PARACHABORA ABYDAS, Herr.-Schäff., Auss.-eur. Schmett, f. 565.
Grenada—Balthazar.

INGURA CANOFUSA, sp. n. (Pl. XVII, fig. 16).

Antennæ of male bipectinate with long branches, the apical part serrate; abdomen with dorsal tufts on 1st three segments.

♂. Head and tegulæ grey; thorax rufous brown; abdomen grey and rufous brown. Forewing grey, the basal, and inner area to postmedial line, yellowish; the basal area with patches of purple brown; an obscure dark waved antemedial line; faint traces of orbicular and reniform spots; the postmedial line double, minutely waved, strongly excurved beyond cell and with a fine black streak from its outer edge above vein 5; the terminal area purple brown with oblique greyish fascia across apical area and greyish apical patch. Hindwing fuscous with the interspaces below the cell whitish; three find dark striæ on inner area above tornus; cilia mostly pale brown.

♀. Forewing with the basal and terminal areas darker, the grey areas more prominent.

Hab. ST. LUCIA; DOMINICA (*W. H. Eliott*). *Exp.*, 34 mill.

INGURA OBROTUNDA, Guen., Noct., ii, p. 312.
St. Lucia; St. Vincent (Windward side); Grenada—St. George's, Balthazar.

EUTELIA RUFATRIX, Wlk., xv, 1775.
Grenada—Balthazar.

CASSANDRIA FILIFERA, Wlk., xi, 719.
St. Lucia.

Subfamily *STICTOPTERINÆ*.

STICTOPTERA TUMIDICOSTA, sp. n. (Pl. XVII, fig. 5).

Palpi with a tuft of hair on inner side of extremity of 2nd joint; hindwing with vein 8 arising from middle of cell; male with the

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costa of forewing slightly arched beyond middle ; the costa of hindwing fringed with hair and strongly arched beyond middle ; the cell of forewing medial in position.

Grey brown ; head, thorax and forewing tinged in parts with pale ferruginous ; abdomen with two dorsal black marks on subterminal segment and a series of oblique black sublateral striæ. Forewing with black points forming traces of sub-basal, antemedial, medial and postmedial lines, the last excurved beyond cell, then incurved to lower angle ; a small incomplete discoidal black annulus ; a curved subterminal series of black points becoming larger towards inner margin ; a terminal series. Hindwing semihyaline white, the terminal area clouded with fuscous.

Hab. GRENADA, Balthazar. *Exp.*, 24 mill.

Subfamily *GONOPTERINÆ.*

COSMOPHILA EROSA, Hübn., Zutr., ff. 287, 288.
Grenada—Mount Gay.

COSMOPHILA EDITRIX, Guen., Noct., ii, p. 404.
St. Lucia ; Grenada.

COSMOPHILA PROPERANS, Wlk., xiii, 999.
Grenada—Mount Gay.

Subfamily *QUADRIFINÆ.*

EREBUS ODORATUS, Linn., Syst. Nat., x, 505.
St. Lucia, St. Vincent.

LETIS MYCERINA, Cram., Pap. Exot., pl. 172, B.
Grenada—Chantilly, Mount Gay ; St. Vincent ; St. Lucia.

PEOSINA PANDROSA, Cram., Pap. Exot., i, p. 122, pl. 77, D.
Dominica.

POLYDESMA SETIPES, Guen., Noct., iii, p. 7.
St. Lucia ; Grenada—Mount Gay, Chantilly, Balthazar. The specimen from St. Lucia belongs to the paler form *ustipennis*, Wlk., also one specimen from Balthazar with a black blotch on the inner area of the forewing.

POLYDESMA LUNATA, Drury, Ill. Exot. Ins., p. 40, pl. 20, f. 3.
Dominica ; Grenada—Mount Gay. The varieties *minerea*, Guen., *viridans*, Guen., and others occur with the typical form.

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CATEPHIA SCRIPTURA, Wlk., xv, 1723; *transversalis*, Wlk., xv, 1734 (Pl. XVII, fig. 10).

Head and thorax pale brown irrorated with dark scales, the outer edge and tips of patagia dark; abdomen fuscous brown. Forewing clothed with rough shining pale yellow brown and purplish brown scales, the basal area darker especially on inner area; a fine waved black sub-basal line retracted to base below cell and with an oblique striga beyond its angle; a white point on lobe of inner margin; a fine sinuous black antemedial line angled outward above vein 1 and joined by a streak to the minutely waved postmedial line which is strongly excurved at middle; orbicular and reniform large and pale yellow brown; traces of a sinuous subterminal line crossed by three black streaks from tenuen above veins 1, 3 and 5; a sinuous terminal black line. Hindwing fuscous brown with slight black striga above tornus; cilia reddish brown; the base of wing and on underside the inner are whitish, a discoidal lunule and curved postmedial line also being present.

Hab. HAITI; DOMINICA. *Exp.*, 44 mill.

PSEUDOBENDIS OPISTOGRAPHA, Guen., Noct., iii, p. 212.
Grenada—Balthazar.

OPHIUSA TROPICALIS, Guen., Noct., iii, p. 238.
Grenada—Balthazar, Mount Gay.

MELIPOTIS FAMELICA, Guen., Noct., iii, p. 62.
Grenada—Balthazar, Mount Gay; Union Is.

MELIPOTIS NOVANDA, Guen., Noct., iii, p. 64.
Grenada—Mount Gay.

MELIPOTIS FASCIOLARIS, Hübn., Zutr., ff. 443, 444.
Grenada—Balthazar.

PANULA INCONSTANS, Guen., Noct., iii, p. 59.
Grenada — Mount Gay; St. Lucia. Numerous varieties.

PANULA SCINDENS, Wlk., xv, 1829.
Grenada—Mount Gay.

BANIANA VELUTICOLLIS, sp. n. (Pl. XVII, fig. 7).

Pale reddish brown; vertex of head, tegulæ and base of patagia rich chocolate brown; abdomen tinged with fuscous. Forewing irrorated with black and with numerous indistinct fine pale striæ; an obliquely curved pale antemedial line defined by rufous on outer side; a similar postmedial line angled inwards at vein 5; a pale-edged brown discoidal line; traces of a subterminal series of dark specks and a more prominent terminal series. Hindwing fuscous brown with traces of discoidal spot; cilia pale brown.

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Hab. ST. LUCIA; ST. VINCENT (*H. H. Smith*). *Exp.*, 22 mill.

POAPHILA LINEOLARIS, Hübn., Samml. eur. Schmett., f. 454.
Grenada—Mount Gay.

POAPHILA GARNOTI, Guen., Noct., iii, p. 306.
Grenada—Balthazar, Mount Gay; St. Lucia.

POAPHILA CRUCIS, Fabr., Ent. Syst., iii, 2, p. 36 (1794), *immunis*, Guen., Noct., iii, p. 305.
St. Vincent (Windward side).

REMIGIA REPANDA, Fabr., Ent. Syst., iii, 2, p. 49 (1794), *megas*, Guen., Noct., iii, p. 317.
St. Vincent; Grenada—Balthazar, Golden Grove.

REMIGIA LATIPES, Guen., Noct., iii, p. 314.
St. Lucia; Dominica; Grenada—Balthazar, Mount Gay.

EPIDROMIA POAPHILOIDES, Guen., Noct., iii, p. 215.
St. Lucia; Grenada—Mount Gay.

THERMESIA INEXACTA, Wlk., xxxiii, 1038.
St. Lucia.

THERMESIA GEMMATALIS, Hübn., Zutr., ff. 153, 154.
St. Vincent; Grenada—Mount Gay.

THERMESIA PAUCULA, Wlk., xv, 1838.
St. Vincent; Grenada—Balthazar.

THERMESIA INCONCISALIS, Wlk., xxxiv, 1167.
Grenada—St. George's; Grenadines—Union I.

AZETA VERSICOLOR, Fabr., Ent. Syst., iii, 2, p. 40 (1794), *repugnalis*, Hübn., Zutr., Samml. Exot. Schmett., iii, p. 37, ff. 575, 576.
Grenada—Balthazar, Golden Grove; Union Is.

GLYMPIS DAMOETASALIS, Wlk., xvi, 252.
Grenada—Mount Gay.

PLEONECTYPTERA PYRALIS, Hübn., Zutr., ff. 127, 128.
Grenada—Mount Gay. The yellow form without rufous on outer area.

TERATOCERA ERYCATA, Cram., Pap. Exot., pl. 287, D, and pl. 370, E.
St. Lucia; Grenada—Balthazar.

AMPHIGONIA POSTPONENS, Wlk., xv, 1856.
Grenada—Balthazar, Mount Gay.

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BENDIS FORMULARIS, Hübn., Zutr., ff. 903, 904.
St. Lucia; St. Vincent; Grenada—Balthazar, Mount Gay.

BENDIS PELIDNALIS, Hübn., Zutr., ff. 169, 170.
Grenada—Balthazar.

ITONIA LIGNARIS, Hübn., Zutr., ff. 317, 318.
Grenada—Mount Gay.

ORÆSIA EXCITANS, Wlk.
Grenada (Leeward side).

ANOMIS ARGILLACEA, Hübn., Zutr., ff. 399, 400.
Grenada—Mount Gay. The purplish-red form of the species.

GONODONTA SOROR, Cram., Pap. Exot., pl. 276, B.
St. Lucia.

GONODONTA INCURVA, Sepp, Ins. Surin., ii, 201, pl. 89.
St. Lucia; Dominica; St. Vincent; Grenada—Balthazar, Mount Gay.

PLUSIA ERIOSOMA, Doubl., Dieff., New Zealand, ii, p. 285.
Grenada—Mount Gay.

PLUSIA VERRUCA, Fabr., Ent. Syst., iii, 2, 238.
Dominica; St. Vincent (Leeward side).

CONCANA MUNDISSIMA, Wlk., xii, 940.
St. Lucia; St. Vincent; Grenada—Mount Gay.

Subfamily *FOCILLINÆ*.

RAPARNA BREVIPENNIS, Wlk., xxxiii, 1039.
St. Lucia; Grenada—Mount Gay.

RAPARNA LITURATA, Wlk., xxxiii, 1094.
Grenada—Mount Gay.

RAPARNA EUPITHECIOIDES, Wlk., xv, 1593.
St. Vincent (Windward side).

CAPNODES STEROPE, Cram., Pap. Exot., iv, pl. 309, E and pl. 312, C.
Grenada—Mount Gay, Balthazar. Most of the specimens are ab. *rufinans*, Guen.

CAPNODES SUBCINERASCENS, Wlk., xv, 1614.
St. Lucia; St. Vincent; Grenada (Windward side).

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CAPNODES BIPUNCTATA, Wlk., xxxiii, 1048.
Grenada—Mount Gay.

CAPNODES DISTACTA, sp. n. (Pl. XVII, fig. 19).

Dark purplish brown; pectus, legs and ventral surface of abdomen whitish. Forewing with slight blue-grey suffusion; a straight antemedial dark line with white mark on it from costa to cell and two minute ochreous points on median nervure and vein 1; an obscure brown discoidal lunule; a minutely waved dark postmedial line with white spot on it at costa, excurved beyond cell, then incurved; traces of a waved subterminal line; a terminal series of dark lunules. Hindwing slightly suffused with blue-grey; a dark discoidal spot; the medial line slightly excurved at middle; an obscure dentate subterminal line with some dark points on it; a terminal series of dark lunules.

Hab. DOMINICA; GRENADA, Mount Gay; TRINIDAD. *Exp.*, 22 mill.

YRIAS QUADRISIGNATA, Wlk., xiii, 1073.
Grenada—Balthazar.

YRIAS PROGENIES, Guen., Noct., iii, p. 323.
Grenada—Balthazar, Caliveny.

SELENIS MONOTROPA, Grote, Can. Ent., viii, 207.
St. Lucia.

ISOGONA NATATRIX, Guen., Noct., iii, p. 323.
Grenada—Balthazar.

Subfamily *DELTOIDINÆ*.

BLEPTINA PENTHUSALIS, Wlk., xvi, 128.
Dominica; St. Vincent.

BLEPTINA THEROALIS, Wlk., xvi, 243.
Grenada—Balthazar, Mount Gay.

BLEPTINA ACASTUSALIS, Wlk., xvi, 122.
St. Lucia; Dominica; St. Vincent (Windward side); Grenada — Balthazar, Mount Gay. Extremely variable, the form *priassalis*, Wlk., occurs with many others.

NODARIA TAGUSALIS, Wlk., xvi, 116.
Grenada—Mount Gay.

NODARIA MYNESALIS, Wlk., xix, 860.
St. Vincent; Grenada—Mount Gay.

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NODARIA GRISEIRENA, sp. n. (Pl. XVII, fig. 13).

♂. Fore tibiæ and tarsi covered by a sheath enclosing flocculent hair; antennæ knotted and tufted with hair at one-third from base; forewing with a large depression on costal area at two-thirds from base, clothed with thick rough scales and covered by a fringe of hair from costa.

Dark brown. Forewing slightly irrorated with grey; waved antemedial, postmedial and subterminal lines, the first defined on inner side, the two latter on outer with white, becoming brownish toward costa, the postmedial line slightly angled below costa and the postmedial and subterminal lines excurved at median nervules; the orbicular represented by a black speck; the reniform with black centre and pale-brownish outline; male with the medial area suffused with ochreous below the depression; a terminal series of black and white lunules. Hindwing with white-edged dark medial and subterminal lines obsolescent except towards inner margin; a terminal series of black and white lunules. Underside with the costal half of forewing and whole of hindwing largely suffused with white, the latter with the lines and a discoidal spot prominent.

Hab. ST. VINCENT (Windward side); GRENADA, Mount Gay, Balthazar (*H. H. Smith*). *Exp.*, 24 mill.

TORTRICODES ALUCITALIS, Guen., Delt. et Pyr., p. 73.
St. Vincent (Windward side).

TORTRICODES ORNEODALIS, Guen., Delt. et Pyr., p. 73.
St. Vincent; Grenada—Mount Gay.

PALTHIS BIZIALIS, Wlk., xix, 865.
St. Vincent; Grenada—Balthazar.

Genus DREPANOPALPIA, nov.

Palpi of male with the 1st joint reaching vertex of head and angled with scales in front, the 2nd joint about twice length of head, recurved over it and fringed with scales in front, the 3rd about twice length of head, curving forward and fringed with scales in front and behind; antennæ with cilia and bristles; fore tibiæ and tarsi covered by a sheath enclosing flocculent hair. Forewing with vein 8 given off from 7 and anastomosing with 9 which arises from 10 to form an areole. Hindwing with vein 5 from below middle of discocellulars; 6, 7, shortly stalked.

Palpi of female with the 2nd joint oblique, straight, about three times length of head, with a small triangular tuft of scales on its inner side at extremity, the 3rd upturned acuminate with small triangular tuft on its outer side.

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DREPANOPALPIA POLYCYMA, sp. n. (Pl. XVII, fig. 14).

Dull brown. Forewing with ante- and postmedial minutely waved black lines, the former slightly excurved below cell, the latter strongly excurved from below costa to vein 2; orbicular and reniform black-edged, the former with brownish centre, the latter with whitish; traces of a waved subterminal line; a terminal series of minute dark lunules. Hindwing with traces of waved medial and subterminal lines; a terminal series of dark points.

Hab. ST. LUCIA (*W. H. Rotherham*). *Exp.*, 24 mill.

Genus PSEUDCRASPEDIA.

Hmpsn., Journ. Bombay Soc., 1898, *ined.*

PSEUDCRASPEDIA MELANOSTICTA, sp. n. (Pl. XVII, fig. 6).

Pale grey-brown. Forewing with black point on costa near base; antemedial blackish points on costa and below cell; medial points on costa and discocellulars, and three brownish points on costa towards apex; traces of waved postmedial and subterminal lines; a terminal series of dark points. Hindwing with black points on discocellulars and below angle of cell; traces of waved postmedial and subterminal lines; a terminal series of dark points.

Hab. ST. VINCENT, Kingston. (*H. H. Smith*). *Exp.*, 12 mill.

Rather smaller and paler than *P. punctata* fromSikhim and with the dark points somewhat differently placed; it is however very closely allied to it and in structure identical.

Genus DITROGOPTERA, nov.

Palpi short upturned, not reaching vertex of head, the 2nd joint fringed with hair towards extremity, the 3rd minute; antennæ of female almost simple; legs long and slender, the spurs long. Forewing with vein 6 from below angle of cell; 7 from angle; 8, 9 stalked; 10 from cell; 11 anastomosing with 12 the outer margin excised below apex; hindwing with veins 3, 4 from angle of cell; 5 from below middle of discocellulars; 6, 7 stalked; the outer margin bilobed, being deeply excised between veins 5 and 6, then oblique and the inner margin short.

DITROGOPTERA TRILINEATA, sp. n. (Pl. XVII, fig. 20).

♀. Grey-brown. Forewing with grey antemedial line excurved at median nervure and outlined on each side with fuscous; a dark

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medial line excurved in cell; a small pale-edged black lunule at lower angle of cell; the postmedial line pale, outlined with fuscous very oblique towards costa, excurved beyond cell, then somewhat sinuous; traces of a waved subterminal line; grey-edged black spots on costa and termen, one at apex being larger. Hindwing with dark medial line with white outer edge almost obsolete except on inner area; a series of grey-edged terminal black spots.

Hab. St. Vincent (*H. H. Smith*). *Exp.*, 14 mill.

Hypena vetustalis, Guen., Delt. et Pyr., p. 35.
St. Vincent; Grenada—Mount Gay.

Hypena androna, Druce, Biol. Centr.-Am., Het., i, p. 434, pl. 35, f. 12.
Dominica.

Hypena pacificalis, Wlk., xvi, 45.
Grenada—Mount Gay; St. Vincent (Windward side).

Hypena exoletalis, Guen., Delt. et Pyr., p. 29.
Grenada—Mount Gay; St. Lucia.

Hypena obditalis, Wlk., xvi, 48.
Grenada—Balthazar, Mount Gay.

Hypena lividalis, Hübn., Eur. Schmett., v, ff. 11, 186.
Grenada—Mount Gay.

Chusaris lunifera, Butl., P. Z. S., 1878, p. 492.
St. Vincent; Grenada—Balthazar.

Chusaris bisinuata, sp. n. (Pl. XVII, fig. 18).

♂. Palpi extending about the length of head; antennæ fasciculate. Head and thorax reddish-brown; abdomen greyish-fuscous, the anal tuft pale. Forewing reddish-brown irrorated with dark scales; two pale discoidal points; a pale postmedial line strongly excurved beyond upper and lower angles of cell then oblique; an obscure sinuous white subterminal line with some black spots on it below costa. Hindwing fuscous.

Hab. Grenada, Balthazar (*H. H. Smith*). *Exp.*, 14 mill.

Rhæsena abarusalis, Wlk., xix, 869.
Grenada—Balthazar, Mount Gay.

Rhæsena nealcesalis, Wlk., xix, 883.
Dominica.

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Family HYPSIDÆ.

LAURONA VINOSA, Drury, Ill. Ex. Ent., i, pl. 23, f. 4.
St. Lucia; St. Vincent.

Family SATURNIADÆ.

AUTOMERIS OBLONGA, Wlk., vi, 1296.
Grenada.

ATTACUS ERYCINA, Shaw, Nat. Misc., vii, pl. 230 (1797).
St. Vincent.

Family SPHINGIDÆ.

Subfamily *CHÆROCAMPINÆ*.

PHILAMPELUS LINNEI, Grote and Rob., Proc. Ent. Soc. Philad., v, p. 182, pl. 3, f. 3 (1865).
Grenada.

CHÆROCAMPA TERSA, Linn., Mant. Plant., p. 508 (1771).
Grenada—Balthazar.

CHÆROCAMPA NECHUS, Cram., Pap. Exot., ii, pl. 178, B.
St. Lucia.

Subfamily *SPHINGINÆ*.

ANCERYX FASCIATA, Swains., Zool. Ill., iii, pl. 150, f. 2 (1823).
St. Lucia; St. Vincent.

DILOPHONOTA ÆNOTRUS, Stoll, Pap. Exot., iv, pl. 301, C. (1780).
Grenada—Mount Gay.

AMPHONYX MEDOR, Stoll, Pap. Exot., iv, pl. 394, A (1782).
Grenada—Grenville.

AMPHONYX DUPONCHELI, Poey, Cent. Lep., pl. iv (1832).
St. Lucia.

PROTOPARCE LUCETIUS, Stoll, Pap. Exot., iv, pl. 301, B (1780).
St. Vincent; Grenada—Mount Gay.

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Subfamily *MACROGLOSSINÆ.*

ENYO LUGUBRIS, Linn., Mant. Plant., p. 537 (1771).
St. Lucia; Grenada (Leeward side).

Family NOTODONTIDÆ.

RHUDA FOCULA, Stoll, Pap. Exot., iv, pl. 383, G, H (1782).
Dominica.

NYSTALEA EBALEA, Stoll, Pap. Exot., iv, pl. 310, C (1781).
St. Lucia.

NYSTALEA GUTTIPLENA, Wlk., xi, 635.
St. Lucia; Dominica.

CHADISRA PUNCTATA, Stoll, Pap. Exot., iv, pl. 307, F.
Dominica.

HEMICERAS LINEA, Guen., Noct., ii, p. 381.
Dominica.

Family LIMACODIDÆ.

SEMYRA COARCTATA, Wlk., v, 1131 (1855).
St. Vincent (Windward side); Grenada—Mount Gay.

ORTHOCRASPEDA BISTRIGATA, sp. n. (Pl. XVII, fig. 21).

♂. Antennæ pectinated to apex. Dull brown with a greyish tinge. Forewing with some whitish scales along median nervure; a short dark-brown streak below middle of median nervure, and longer streak in end of cell; a pale bisinuate postmedial line.

Hab. ST. LUCIA; GRENADINES, Mustique I. (*H. H. Smith*). *Exp.*, 24 mill.

Family COSSIDÆ.

DUOMITUS PUNCTIFER, sp. n. (Pl. XVII, fig. 11).

♂. Grey; head and thorax mixed with dark brown; antennæ rufous; tegulæ dark brown. Forewing whitish irrorated with dark brown; dark brown strigæ forming obscure sub-basal, antemedial, medial and four postmedial series; a series of small dark spots on costa; a diffused discoidal patch with brown spot at its lower extremity below base of vein 2; an obscure subterminal spot on vein 3. Hindwing whitish with faint traces of striæ.

One specimen is browner with the markings obscured.

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Hab. DOMINICA (*Eliott*); ST. LUCIA; ST. VINCENT; GRENADA, Mirabeau, Balthazar, Mount Gay (*H. H. Smith*). *Exp.*, 30–54 mill.

GIVIRA PULVEROSA, sp. n. (Pl. XVII, fig. 12).

Brownish grey; abdomen dorsally tinged with fuscous. Forewing with some small rufous spots on costal area, in cell, an antemedial series and a cluster below middle of vein 2; brown striæ on inner and terminal areas, and obscure subterminal and terminal series of small spots. Hindwing fuscous-brown with traces of striæ and terminal series of spots.

Hab. ST. LUCIA; ST. VINCENT (Windward side); GRENADA (Windward side) (*H. H. Smith*). *Exp.* 40 mill.

Family PSYCHIDÆ.

OIKETICUS KIRBYI, Guild., Trans. Linn. Soc., xv, p. 375, pl. 6, 7 (1827).
St. Lucia.

EXPLANATION OF PLATE XVII.

[*See explanation facing the* PLATE.]

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XV. *Lepidoptera Heterocera from Northern China, Japan, and Corea.* By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.

[Read June 1st, 1898.]

THE three hundred and fifty-three species of Lepidoptera Heterocera dealt with in this paper are distributed among various families as follows:—

SATURNIIDÆ	16	ZYGÆNIDÆ	81
BRAHMÆIDÆ	4	PSYCHIDÆ	7
BOMBYCIDÆ	6	COSSIDÆ	7
EUPTEROTIDÆ	5	HEPIALIDÆ	8
SPHINGIDÆ	59	CALLIDULIDÆ	4
NOTODONTIDÆ	70	DREPANULIDÆ	47
SYNTOMIDÆ	23	THYRIDIDÆ	16

As in my list of species in the families Epicopiidæ, Uraniidæ, Epiplemidæ, and Geometridæ (Ann. and Mag. Nat. Hist., 1897 and 1898), the present arrangement is in accordance with that of Sir George Hampson (The Fauna of British India, Moths).

Thirty-seven of the species enumerated are, I believe, now described for the first time, and these, together with thirty-three others that I had previously described elsewhere, represent one-fifth of the whole number of species, belonging to the families mentioned, so far known to occur in the area under consideration.

The number of new species in these families is much less than that found among the nine hundred and sixty-six species belonging to the families mentioned in my former paper; among them it was three hundred and fifty-six, or over one-third of the whole.

Family SATURNIIDÆ.

Genus ACTIAS.

Leach; Hampson, Fauna Brit. Ind., Moths, i, p. 13 (1892).

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1. *Actias sinensis.*

Tropæa sinensis, Walk., Cat. Lep. Het., vi, p. 1264 (1855).

I have one example, taken in July at Kiukiang. My collectors did not obtain the species in any other part of China that they visited.

Hab. CENTRAL CHINA.

2. *Actias selene.*

Echidna selene, Hübn., Exot. Schmett., i, pl. clxxii, fig. 3.
Actias selene, Macleay, Zool. Miscl., ii, p. 70 (1815); Moore, Cat. Lep. Mus. E.I.C., ii, p. 400, pl. xix, figs. 3, 3*a* (1859); Leech, Proc. Zool. Soc. Lond., 1888, p. 634.
Actias ningpoana, Feld., Wien. ent. Mon., vi, p. 34 (1862).
Saturnia artemis, Brem., Motsch. Etud. Ent., 1852, p. 64; Lep. Ost-Sib., pl. ii, figs. 6, ♂, and 7, ♀.
Tropæa artemis, Kirby, Cat. Lep. Het., i, p. 765 (1892); Staud., Rom. sur Lép., vi, p. 330 (1892).
Tropæa maasseni, Kirby, Cat. Lep. Het., i, p. 765 (1892).
Tropæa gnoma, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 480 (1877); Ill. Typ. Lep. Het., ii, pl. xxv, fig. 1 (1878).
Tropæa aliena, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 355 (1879).
Tropæa dulcinea, Butl., Trans. Ent. Soc. Lond., 1881, p. 14.
Tropæa mandschurica, Staud., Rom. sur Lép., vi, p. 331 (1892).
Saturnia felices, Oberth., Etud. d'Entom., xx, p. 67, pl. ix, fig. 61.

Distribution. Throughout INDIA, CEYLON, and BURMA (*Hampson*); EASTERN, CENTRAL and WESTERN CHINA; JAPAN; KIUSHIU; COREA; AMURLAND.

Staudinger (Rom. sur Lép., vi, p. 330) states that he has received only *artemis* from Japan and is of opinion that my specimens from that country are wrongly referred by me to *selene*. He mentions that I do not refer to the length of tail and suggests that if I had seen Bremer's figure and read the description of *artemis* I should have ascertained that the tails are shorter than those of *selene* and differently formed.

Some specimens received from Hertz, who obtained them in the country to the north of Pekin, are referred to by Staudinger as a distinct species under the name

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mandschurica; these examples he says are not larger than a medium-sized *selene*. Other specimens received at the same time exceed *artemis* in size but are much smaller than *selene* and have the same shaped tails and the pointed wings of the latter, and therefore differ in these characters from *artemis*. *Mandschurica* is further described as follows—the primaries have double dark transverse lines, of which the outer is generally rudimentary; the secondaries have a dark, sometimes faint, transverse line which turns off sharply to the abdominal margin; ocelli as in *artemis* but rather larger.

Staudinger adds that *selene* has also large ocelli which are tinged with pink on the outer half, but this species may be distinguished from his *mandschurica* by the tails, which in the males are broadly coloured with pink on the upper portion and more slightly so in the females.

Ningpoana, Feld., is described as having the outer lines hardly conspicuous, smaller ocelli and being entirely without lilacine markings on the anal portions of the secondaries. *Gnoma*, Butl., has narrower and more divergent tails than *artemis*, and *dulcinea*, Butl., appears to be a slight modification of *gnoma*.

I find that the species varies in expanse from 108 to 153 millim. in the male and from 116 to 168 millim. in the female. In colour the variation is from pale bluish-green to yellow faintly tinged with green. None of the transverse markings is constant; in some specimens one or other of the lines may be strongly defined, whilst in other examples all the lines may be entirely absent: the ocelli vary in size and shape, and the tails may be as short and obtuse as in *A. isabellæ* from Europe or as long as in extremes of the typical form of *A. selene*. The pink coloration on the upper portion of the tails and the outer parts of the ocelli is sometimes present and sometimes absent in either sex, and in Indian as well as in Eastern Asian specimens.

All these variations together with their intergrades, and with other aberrations in addition, are represented in the series of twenty-five examples which I have retained out of a large number of specimens received from Amurland, Corea, and various parts of China and Japan.

It is of the greatest importance when dealing with a variable species, such as *A. selene*, to have an extensive series in which all the named forms are represented as well as the connecting links. Had Dr. Staudinger pos-

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sessed the necessary material and at the same time studied the synonymy of the species as cited in my paper (P.Z.S., 1888, p. 634) he would have found his description of *mandschurica* superfluous.

3. *Actias dubernardi.*

Tropæa dubernardi, Oberth., Bull. Soc. Ent. Fr., 1897, p. 174 (fig. 1).

Oberthür describes this species from Tsekou.

Hab. WESTERN CHINA.

Genus ATTACUS.

Linn.; Hampson, Fauna Brit. Ind., Moths, i, p. 15 (1892).

4. *Attacus cynthia.*

Phalæna cynthia, Drury, Ill. Exot. Ent., ii, pl. vi, fig. 2 (1773).

Philosamia cynthia, Kirby, Cat. Lep. Het., p. 748 (1892).

Attacus walkeri, Feld., Wien. ent. Mon., vi, p. 34 (1862).

Attacus pryeri, Butl., Proc. Zool. Soc. Lond., 1878, p. 388; Ill. Typ. Lep. Het., iii, pl. xliii, fig. 5 (1879).

Attacus cynthia, Leech, Proc. Zool. Soc. Lond., 1888, p. 634; Hampson, Fauna Brit. Ind., Moths, i, p. 16 (1892).

The species is represented in the area here dealt with by the forms *pryeri* and *walkeri*.

Distribution. SIKHIM; ASSAM; ? CEYLON (*Hampson*); NORTHERN, EASTERN, CENTRAL, and WESTERN CHINA; JAPAN; KIUSHIU.

Genus CALIGULA.

Môore, Trans. Ent. Soc. Lond., (3), i, p. 321 (1862).

5. *Caligula japonica.*

Caligula japonica, Moore, Trans. Ent. Soc. Lond., 1862, p. 322 (pupa-case); Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 479 (1877); Ill. Typ. Lep. Het., ii, pl. xxvi, fig. 2 (1878); Leech, Proc. Zool. Soc. Lond., 1888, p. 633.

Caligula castanea, Swinhoe, Cat. Lep. Het. Oxford, p. 249 (1892).

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I met with this very variable species in October at Nikko and my native collector obtained it in the island of Kiushiu.

Col. Swinhoe considers his *castanea* to be a pale form of *C. japonica*, and in this opinion I quite concur. The form is not an uncommon one.

Distribution. JAPAN; KIUSHIU.

6. *Caligula boisduvalii.*

Saturnia boisduvalii, Evers., Bull. Mosc., 1846, (3), p. 83, pl. i, fig. 1; 1847, p. 7, pl. iv, fig. 5; Herr.-Schäff., Schmett. Eur., vi, figs. 148—150 (1849).

Caligula jonasii, Butl., Ann. and Mag. Nat. Hist., (4), xx, p. 479 (1877); Ill. Typ. Lep. Het., ii, pl. xxv, fig. 2 (1878); Leech, P.Z.S., 1888, p. 633.

Neoris jonasi, Kirby, Cat. Lep. Het., p. 761 (1892).

I met with this species at Oiwake and Nikko in September and October. There was a fine series from Yokohama in Pryer's collection.

Staudinger (Rom. sur. Lép., vi, p. 325) suggests that the Japanese and Amurland forms of this species should be known as var. *jonasi*, as they differ from the type, which is from Kiachta, in being smaller and darker. The Japanese specimens in my series are larger and more tinted with olivaceous than those from Amurland.

Distribution. SIBERIA; AMURLAND; JAPAN.

Genus ANTHERÆA.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 18 (1892).

7. *Antheræa pernyi.*

Saturnia pernyi, Guérin, Rév. Zool., 1855, p. 6, pl. vi, fig. 1.

Bombyx yamamai, Guérin, *op. cit.*, 1861, p. 435, pls. xi—xiii.

Antheræa confuci, Moore, Proc. Zool. Soc. Lond., 1874, p. 578.

Antheræa hazina, fentoni, calida, morosa, Butl., Trans. Ent. Soc. Lond., 1881, pp. 13, 14.

Saturnia sergestus, Westw., Proc. Zool. Soc. Lond., 1881, p. 143, pl. xiii, fig. 2.

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An exceedingly variable species. The examples selected for my series range in colour from pale brown, through ochreous and reddish brown, to "rusty orange"; there are also specimens which are olivaceous in colour, while others are fuliginous-brown. There is some variation in marking, but, as I mentioned in my remarks on the species (Proc. Zool. Soc. Lond., 1888, pp. 633, 634), in no case is the aberration sufficient to justify separation of the specimen or specimens exhibiting it from *A. pernyi*. The "double submarginal line" referred to by Moore (*l. c.*) is not an uncommon character in this species.

Distribution. AMURLAND; NORTHERN, EASTERN, CENTRAL and WESTERN CHINA; JAPAN; KIUSHIU.

8. *Antheræa hartii.*

Antheræa hartii, Moore, Ann. and Mag. Nat. Hist., (6) ix, p. 450 (1892).

This distinct species was described from Newchwang, N. China.

Moore states that the natives rear the larva in a semi-domesticated state on oak trees, and that there are two broods in the year.

Hab. NORTH CHINA.

Genus SATURNIA.

Schrank, Faun. Boica, ii (1), p. 149 (1802).

9. *Saturnia bieti.*

Saturnia bieti, Oberth., Etud. d'Entom., xi, p. 31, pl. vii, fig. 58 (1886).

Oberthür's type was from Western China, but the exact locality is not given. It appears to be most nearly allied to *S. lindia*, Moore from Kulu and Kashmir.

I received a male specimen taken in a locality to the north of Ta-chien-lu. In this example the coloration is darker and the markings more pronounced than in Oberthür's figure of the type; further, the apices are not tinged with pink.

Hab. WESTERN CHINA.

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10. *Saturnia pyretorum.*

Saturnia pyretorum, Boisd.; Westw., Cab. Orient. Ent., p. 49, pl. xxiv, fig. 2 (1848).
Heniocha pyretorum, Kirby, Cat. Lep. Het., p. 771 (1892).

A female specimen was bred by Pratt in March 1888 from a pupa he obtained at Kiukiang in the previous year.

Hampson (Fauna Brit. Ind., Moths, i, p. 23) gives *S. cidosa*, Moore as a synonym.

Distribution. SIKHIM (*Hampson*); CENTRAL CHINA.

Genus LOEPA.

Moore, Cat. Lep. Mus. E.I.C., ii, p. 399 (1859).

11. *Loepa katinka.*

Saturnia katinka, Westw., Cab. Orient. Ent., p. 25, pl. xii, fig. 2 (1848).
Loepa miranda, Moore, Trans. Ent. Soc. Lond., (3) ii, p. 424 (1865); Preiss, Abbild. Nachtschmett, pl. v, fig. 2 (1888); Kirby, Cat. Lep. Het., p. 762 (1892).
Loepa katinka, Hampson, Fauna Brit. Ind., Moths, i, p. 25 (1892).

My collectors obtained this species at Chang-yang, Ship-y-shan, Omei-shan, Moupin, and Chia-kou-ho.

The males range in expanse from 90 to 104 millim. and the females from 102 to 114 millim. The smallest male example is from Omei-shan and the largest from Moupin. The smallest female is also from Omei-shan and the largest from Chang-yang. All the specimens were taken in July.

Distribution. HIMALAYAS; ASSAM; YUNNAN; JAVA (Hampson); CENTRAL and WESTERN CHINA.

12. *Loepa oberthüri.*

Saturnia oberthüri, Leech, Entom., xxiii, p. 49 (1890).
Loepa dogninia, Sonthonnax, Échange, 1892, p. 20.

A male specimen from Ichang, taken in August.

Hab. CENTRAL CHINA.

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Genus RHODINIA.

Rhodia, Moore, Proc. Zool. Soc. Lond., 1872, p. 578 (*nom. præocc.*).
Rhodinia, Staud., Rom. sur Lép., vi, p. 327 (1892).

13. *Rhodinia fugax.*

Rhodia fugax, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 480 (1877); Ill. Typ. Lep. Het., ii, pl. xxvi, fig. 1 (1878); Leech, Proc. Zool. Soc. Lond., 1888, p. 633.
Saturnia diana, Oberth., Bull. Soc. Ent. Fr., (6) vi, p. xlvii (1886).

There was a nice series from Yokohama in Pryer's collection. The var. *diana*, Oberth., is more suffused and darker than the type.
Distribution. AMURLAND; JAPAN.

14. *Rhodinia davidi.*

Saturnia davidi, Oberth., Etud. d'Entom., xi, p. 31, pl. vii, fig. 51 (1886).
Rhodia davidi, Kirby, Cat. Lep. Het., p. 762 (1892).

Oberthür describes this species from Western China, but does not indicate the exact locality. It is nearly allied to *R. jankowskii*, Ob., from Askold, but in colour it resembles the female of *R. fugax*, Butl.
Hab. WESTERN CHINA.

Genus SALASSA.

Moore; Hampson, Fauna Brit. Ind., Moths, i, p. 26 (1892).

15. *Salassa thespis.*

Antheræa thespis, Leech, Entom., xxiii. p. 112 (April, 1890).
Rhodia thespis, Kirby, Cat. Lep. Het., p. 762 (1892).
? *Saturnia olivacea*, Oberth., Etud. d'Entom., xiii, p. 44, pl. x, fig. 107 ♂ (May, 1890).

I originally described this species from a female specimen received from Ship-y-shan, taken in September. I have since received another example of the same sex from Pu-tsu-fong.

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Oberthür describes a male specimen, taken by Mgr. Biet at Ta-chien-lu, under the name *olivacea*. This is probably the male sex of *A. thespis*, and differs from the female in being smaller and in having the transverse bands more distinct.

The species appears to be nearly allied to *S. lola*, Westw., from Sikhim.

Rothschild (Novit. Zool., ii, p. 45) refers *S. megasticta*, Swinhoe (Trans. Ent. Soc. Lond., 1894, p. 153), to *A. thespis* as an aberration.

Distribution. CENTRAL and WESTERN CHINA; NORTH INDIA.

Genus AGLIA.

Ochs., Schmett. Eur., iii, p. 11 (1810).

16. *Aglia tau.*

Bombyx tau, Linn., Syst. Nat., i, p. 497 (1758); Hübn., Bomb., pl. xiii, figs. 51, 52 (1800 ?).
Aglia tau, var. *japonica*, Leech, Proc. Zool. Soc. Lond., 1888, p. 632.

I have specimens of both sexes of var. *japonica* from Yesso, some of which are from Hakodate.

Distribution. EUROPE.—AMURLAND; YESSO.

Family BRAHMÆIDÆ.

Genus BRAHMÆA.

Walk., Cat. Lep. Het., vi, p. 1315 (1855).

17. *Brahmæa certhia.*

Bombyx certhia, Fabr., Ent. Syst., iii, p. 412 (1793).
Saturnia lunulata, Brem. and Grey, Motsch. Etud. Ent., i, p. 64 (1852).
Brahmæa lunulata, Mén., Rom. sur Lép., iii, p. 345 (1887).
Saturnia undulata, Brem. and Grey, Schmett. nörd. China, p. 16, pl. v, fig. 3 (1853).
Brahmæa carpenteri, Butl., Ann. and Mag. Nat. Hist., (5) xi, p. 114 (1883).

My collectors obtained five specimens at Kiukiang; these appear to be referable to the form *undulata*. Butler describes a form from Corea as *carpenteri*. Fixsen records

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a specimen from Corea which he states agrees with Bremer's figure of *undulata*.

Distribution. AMURLAND; COREA; NORTHERN and CENTRAL CHINA.

18. *Brahmæa wallichii*.

Bombyx wallichii, Gray, Zool. Misc., p. 39, pls. 1, 2 (1831).
Brahmæa wallichii, Butl., Ill. Typ. Lep. Het., v, pl. xcv, figs. 5, 6 (1881); Kirby, Cat. Lep. Het., p. 724 (1892); Hampson, Fauna Brit. Ind., Moths, i, p. 30 (1892).
Brahmæa certhia (*part*), Leech, Proc. Zool. Soc. Lond., 1888, p. 635.

I received a female specimen from Chang-yang, taken in July.

Distribution. NEPAL; SIKHIM; KHÁSI HILLS; ASSAM; UPPER BURMA (*Hampson*); CENTRAL CHINA.

19. *Brahmæa hearseyi*.

Brahmæa hearseyi, White, Proc. Ent. Soc. Lond., 1862, p. 26.
Brahmæa whitei, Butl., Ill. Typ. Lep. Het., v, p. 62, pl. xcv, figs. 1, 2 (1881).

One male specimen from Omei-shan and one rom the Province of Kwei-chow; both taken in July.

Distribution. MUSSOORIE; SIKHIM; BURMA (*Hampson*); WESTERN CHINA.

20. *Brahmæa japonica*.

Brahmæa japonica, Butl., Ent. Mo. Mag., x, p. 56 (1873); Ill. Typ. Lep. Het., ii, p. 17, pl. xxvi, fig. 3 (1878); Leech, Proc. Zool. Soc. Lond., 1888, p. 635.
Brahmæa mniszechii, Feld., Reise Nov., Lep., iv, pl. xciii, figs. 4, 5 (1874).
Brahmæa nigrans, Butl., Ent. Mo. Mag., xvii, p. 110 (1880); Waterh., Aid, i, pl. xxix (1881).

There was a fine series of this variable species from Yokohama in Pryer's collection, and I have received specimens from Mr. Manley, all evidently bred.

In Felder's figure of *mniszechii* (4) the abdomen and the ocellus on the inner margin of the primaries are ochreous, but in fig. 5 the body is represented in the proper colour.

Hab. JAPAN.

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Family BOMBYCIDÆ.

Genus BOMBYX.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 32 (1892).

21. *Bombyx mori.*

Bombyx mori, Linn., Syst. Nat., i, p. 499 (1758); Hampson, Fauna Brit. Ind., Moths, i, p. 32 (1892); Kirby, Cat. Lep. Het., p. 718 (1892).
Bombyx sinensis, Moore and Hutt., Trans. Ent. Soc. Lond., (3) i, p. 313 (1862); *id.* ii, p. 313 (1865).

Specimens from Yokohama in Pryer's collection.
Distribution. CHINA; in a domesticated state throughout India and Europe (*Hampson*); JAPAN.

22. *Bombyx mandarinus.*

Theophila mandarina, Moore, Proc. Zool. Soc. Lond., 1872, p. 576, pl. xxxiii, fig. 5.

This is probably the wild form of *Bombyx mori*. In colour it is darker, and the markings are distinct; the female is much larger than the same sex of *B. mori*.
Distribution. JAPAN; YESSO; COREA; EASTERN CHINA.

Genus RONDOTIA.

Moore, Ann. and Mag. Nat. Hist., (5) xx, p. 491 (1885).
Ectrocta, Hampson, Fauna Brit. Ind., Moths, i, p. 33 (1892).

23. *Rondotia menciana.*

Rondotia menciana, Moore, Ann. and Mag. Nat. Hist., (5) xv, p. 491 (1885).
Rondotia lurida, Fixsen, Rom. sur Lép., iii, p. 346, pl. xv, fig. 8 (1887).

Lurida only appears to differ from *menciana* by the fringes towards the anal angle of the secondaries not being marked with black.
I have a fine series from Ichang, taken in June, and from a place 30 miles miles north of Ichang, taken in August.
Distribution. COREA; EASTERN AND CENTRAL CHINA.

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24. *Rondotia lineata*, sp. n.

Creamy white. Primaries have a curved and slightly angulated sub-basal line, streak on discocellulars, and submarginal line, all blackish; there is a black apical patch limited inwardly by the submarginal line, and extending along outer margin to just below vein 4. Secondaries have a black curved post-medial line united with a black spot on abdominal margin but not extending to costa; there is a black spot on abdominal margin about one-third from base.

Expanse, ♂ 34–42 millim.; ♀ 42–54 millim.

I have twelve male specimens and five females; these were obtained at Moupin, Wa-shan, Chia-kou-ho, Wa-ssu-kow, Chia-ting-fu, and Chung-king; the latter were bred examples, but unfortunately Mr. Pratt did not take any notes of the habits or appearance of the larva. The species occurs in May, June, and July.

Superficially resembles *R.* (*Ectrocta*) *diaphana*, Hampson, but differs principally from that species in the character of the transverse markings.

Hab. WESTERN CHINA.

Genus MUSTILIA.

Walk., Cat. Lep. Het. xxxii, p 580 (1865).

25. *Mustilia falcipennis.*

Mustilia falcipennis, Walk., Cat. Lep. Het., xxxii, p. 581 (1865); Hampson, Fauna Brit. Ind., Moths, i, p. 38 (1892).

One male specimen obtained from a native collector, who probably took it in the neighbourhood of Ta-chien-lu.

Distribution. SIKHIM; BHUTAN (*Hampson*); WESTERN CHINA.

Genus ANDRACA.

Walk., Cat. Lep. Het., xxxii, p. 581 (1865).

26. *Andraca gracilis.*

Andraca gracilis, Butl., Cist. Ent., iii, p. 125 (1885).

Of this species, which was described from Nikko, there were two examples in Pryer's collection from the same locality.

Hab. JAPAN.

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Family *EUPTEROTIDÆ*.

Genus GANGARIDES.

Moore, Proc. Zool. Soc. Lond., 1865, p. 821.

27. *Gangarides roseus.*

Apona rosea, Walk., Cat. Lep. Het., xxxii, p. 513 (1865).
Gangarides rosea, Moore, Proc. Zool. Soc. Lond., 1865, p. 821.
Gangarides dharma, Moore, *l.c.*, pl. xliii, fig. 7.
Gangarides roseus, Hampson, Fauna Brit. Ind., Moths, i, p. 42, (1892).

I have examples from Chang-yang, Ichang, Chia-ting-fu, Moupin, and the province of Kwei-chow, taken in July and August. These make a variable series; some of the specimens agree with *dharma*, Moore, others are intermediate between *dharma* and *roseus*.

Distribution. SIKHIM; BHUTAN; BURMA (*Hampson*); CENTRAL AND WESTERN CHINA.

Genus APHA.

Walk., Cat. Lep. Het., v. p. 1180 (1855).

28. *Apha tychoona.*

Apha tychoona, Butl., Ent. Mo. Mag., xiv, p. 207 (1878); Ill. Typ. Lep. Het., ii, p. 18. pl. xxvii, fig. 5 (1878).

A common species in Japan, Yesso, and Kiushiu. I received specimens from Chang-yang, Moupin, and the province of Kwei-chow.

Distribution. JAPAN; YESSO; KIUSHIU; CENTRAL and WESTERN CHINA.

Genus APONA.

Walk., Cat. Lep. Het., vii, p. 1762 (1856).
Hampson, Fauna Brit. Ind., Moths, i, p. 52 (1892).

29. *Apona mandarina.*

Jana mandarina, Leech, Entom., xxiii, p. 112 (1890).

I have specimens from Chang-yang, Omei-shan, Chia-kou-ho, Pu-tsu-fong, and the province of Kwei-chow, taken in June and July. The species varies in ground tint from ashy-grey through fawn colour to a dark chestnut.

Distribution. CENTRAL and WESTERN CHINA.

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Genus EUPTEROTE.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 54 (1892).

30. *Eupterote chinensis*, sp. n.

♂ Pale yellow. Primaries have some chocolate marks on the costa and the apical area is clouded with the same colour; there are indications of two postmedial lines on costal area, but these only extend to vein 6; submarginal wavy, but not clearly defined, preceded by one or two chocolate spots towards inner margin. Secondaries have an indistinct, waved, submarginal line, preceded by chocolate spots towards costa and inner margin.

Under surface as above, but the costa of primaries is broadly chocolate and there are some spots of the same colour on the costa of secondaries.

Antennæ, head and fore legs chocolate brown.

♀ Brighter yellow, without submarginal line and chocolate markings on costa and apical area on both surfaces.

Expanse, ♂ 72–80 millim.; ♀ 89–92 millim.

Eight male specimens and two females from the province of Kwei-chow, June and July.

One male agrees with the female in absence of marking.

Hab. CHINA.

Genus PRISMOSTICTA.

Butl., Ann. and Mag. Nat. Hist., (5) vi, p. 67 (1880).

31. *Prismosticta hyalinata.*

Prismosticta hyalinata, Butl., Cist. Ent., iii, p. 125 (1885).

There was a series from Oiwake and Nikko in Pryer's collection and I have specimens taken by Mr. Manley at Yokohama.

Hab. JAPAN.

Family SPHINGIDÆ.

Subfamily *ACHERONTIINÆ*.

Genus ACHERONTIA.

Ochs., Schmett. Eur., iv, p. 44 (1816).

32. *Acherontia atropos.*

Sphinx atropos, Linn., Syst. Nat., i, p. 490 (1758); Hübn., Sphing., fig. 70.

Manduca atropos, Kirby, Cat. Lep. Het., p. 700 (1892).

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Acherontia styx, Westw., Cab. Orient. Ent., p. 88, pl. xlii, fig. 3 (1848); Hampson, Fauna Brit. Ind., Moths, i, p. 67 (1892).

Acherontia medusa, Butl., Trans. Zool. Soc. Lond., ix, p. 597 (1876); Ill. Typ. Lep. Het., iii, pl. xli, fig. 5 (1879).

I obtained the species in various parts of Japan, where it is very plentiful; I also took a specimen at Gensan. In a series received from Ichang all the specimens were below the average size, and some of the examples measure only 70–73 millim. in expanse. The characters given by Hampson as distinguishing *styx* from *atropos* appear to be of little specific value. The bands on the under surface of the abdomen are sometimes almost absent in European specimens and in the Asiatic form are usually represented by rows of spots. Then with regard to the two medial bands on the under surface of the forewings, these may be present or absent in specimens from either region.

Medusa, Butl., from Japan has no constant character to separate it from the Indian form.

Distribution. Throughout INDIA and CEYLON; ASIA MINOR; SIAM; BORNEO; CELEBES; TIMOR; PHILIPPINES (*Hampson*); COREA; JAPAN; KIUSHIU; CENTRAL, EASTERN, and SOUTHERN CHINA.—EUROPE.—NORTH AFRICA.

33. *Acherontia lachesis*.

Sphinx lachesis, Fabr., Ent. Syst., Suppl., p. 434 (1798).

Acherontia morta, Hübn., Verz. Schmett., p. 140 (1822 ?); Leech, Trans. Ent. Soc. Lond., 1889, p. 119; Swinhoe, Cat. Lep. Het. Oxford, p. 31 (1892).

Acherontia satanas, Boisd., Spec. Gén. Lép., i, pl. xvi, fig. 1 (1836).

Acherontia lethe, Westw., Cab. Orient. Ent., p. 88, pl. xlii, fig. 3 (1848).

Acherontia lachesis, Hampson, Fauna Brit. Ind., Moths, i, p. 67 (1892).

Manduca lachesis, Kirby, Cat. Lep. Het., p. 700 (1892).

My collectors met with this species at Kiukiang and various localities in Western China in June, July and August. The specimens do not appear to differ from Indian examples.

Distribution. Throughout INDIA and CEYLON; SIAM; PENANG; JAVA (*Hampson*); CENTRAL and WESTERN CHINA.

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Subfamily *SMERINTHINÆ*.

[Genus POLYPTYCHUS.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 68 (1892).

34. *Polyptychus dyras.*

Smerinthus dyras, Walk., Cat. Lep. Het., viii, p. 250 (1856).
Marumba dyras, Kirby, Cat. Lep. Het., i, p. 708 (1892).
Triptogon cristata, Butl., Proc. Zool. Soc. Lond., 1875, p. 253.
Smerinthus sperchius, Mén., Lep. Mus. Petr., ii, p. 137, pl. xiii, fig. 5 (1857).
Triptogon piceipennis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 393 (1877); Ill. Typ. Lep. Het., ii, p. 2, pl. xxi, fig. 4 (1878).
Polyptychus dyras, Hampson, Fauna Brit. Ind., Moths, i, p. 69 (1892).

There was a nice series of this variable species in Pryer's collection. I met with examples at Tsuruga in July and received one specimen, captured in June, at Moupin; all these are of the *sperchius* or *piceipennis* form. One male taken at Omei-shan in June is referable to *cristata*, Butl.

Pryer states that the larva in Japan feeds upon chestnut.

Distribution. NORTH INDIA; WESTERN CHINA; JAPAN; KIUSHIU.

35. *Polyptychus echephron.*

Smerinthus echephron, Boisd., Spec. Gén. Lép., Het., i, p. 21, pl. iii, fig. 3 (1875).
Marumba echephron, Kirby, Cat. Lep. Het., i, p. 706 (1892).

Described from Japan and probably a form of *P. dyras* Walk.

Hab. JAPAN.

36. *Polyptychus gaschkewitschii.*

Smerinthus gaschkewitschii, Brem. and Gray, Motsch. Etud, Ent., i, p. 62 (1852); Schmett. nörd. China, p. 13, pl. v, fig. 2 (1853).

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Smerinthus complacens, Walk., Cat. Lep. Het., xxxi, p. 40 (1864); Butl., Ill. Typ. Het., iii, p. 2, pl. xli, fig. 4 (1879).
Triptogon roseipennis, Butl., Proc. Zool. Soc. Lond., 1875, p. 257; Trans. Zool. Soc. Lond., ix, p. 588, pl. xci, fig. 6, transf. (1876); Ill. Typ. Lep. Het., iii, p. 2, pl. xli, fig. 3 (1879).
Marumba roseipennis, Kirby, Cat. Lep. Het., p. 707 (1892).
Triptogon complacens, Leech, Proc. Zool. Soc. Lond., 1888, p. 586.
Smerinthus roseipennis, var. *carstanjeni*, Staud., Rom. sur Lép., iii, p. 159, pl. ix, figs. 2 a, 2 b (1887).
Smerinthus gaschkewitschii, var. *carstanjeni*, Staud., Rom. sur Lép., vi, p. 235 (1892).
Smerinthus heynei, Austaut, Le Nat., 1892, p. 68.

A fine series from Yokohama in Pryer's collection. I met with the species at Nagasaki in May and have received it from Hakodate and also from Moupin; the specimens from the latter place were taken in June.

The larva is stated by Staudinger to feed on *Pyrus* and *Cratægus*, whilst Dorries says that it feeds on cherry and plum and is similar in appearance to the larva of *Smerinthus ocellatus*.

Austaut's description of *heynei* evidently applies to Japanese representatives of this species. He refers to *gaschkewitschii* and var. *carstanjeni* as though he considered them distinct species, whilst he does not mention either *roseipennis* or *complacens*.

Distribution. NORTHERN and WESTERN CHINA; JAPAN; KIUSHIU; AMURLAND.

37. *Polyptychus dissimilis.*

Triptogon dissimilis, Brem., Bull. Acad. Petr., iii, p. 475 (1861).
Smerinthus dissimilis, Brem., Lep. Ost-Sib., p. 35, pl. iii, fig. 12 (1864).
Marumba dissimilis, Kirby, Cat. Lep. Het., p. 707 (1892).
Phillosphingia perundulans, Swinhoe, Ann. and Mag. Nat. Hist., (6) xix, p. 164 (1897).

There were specimens from Oiwake and Tokio in Pryer's collection which agree with examples from Amurland. In one individual from Kiukiang the body and ground colour of the wings are rosy-brown instead of olive-brown.

Distribution. AMURLAND; JAPAN.

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Genus DILINA.

Dalm., Vet. Akad. Handl., 1816, p. 212.

38. *Dilina christophi.*

Smerinthus christophi, Staud., Rom. sur Lép., iii, p. 162, pl. ix, figs. 3 *a*, *b*, and pl. xi, fig. 1 (1887).
Dilina christophi, Kirby, Cat. Lep. Het., p. 709 (1892).

There were specimens from Fujisan and Yesso in Pryer's collection.

This species, which is closely allied to *D. tiliæ*, can be readily separated by the absence of any green coloration, by the contour of the central fascia, and by the uniform dark brown colour of the thorax. Although my series of *D. tiliæ* comprises 165 specimens and includes all the known aberrations, there is nothing among them that could be mistaken for *D. christophi*.

The larva feeds on *Alnus incana*, W., and is stated to resemble that of *D. tiliæ* very closely.

Distribution. AMURLAND; JAPAN; YESSO.

Genus SMERINTHUS.

Latr., Hist. Nat. Ins., iii, p. 401 (1802).

39. *Smerinthus ocellatus.*

Sphinx ocellata, Linn., Syst. Nat., i, p. 489 (1758).
Smerinthus ocellatus, Kirby, Cat. Lep. Het., p. 711 (1892)
Smerinthus planus, Walk., Cat. Lep. Het., viii, p. 254 (1856).
Smerinthus argus, Mén., Lep. Mus. Petr., p. 126, pl. xiii., fig. 3 (1857).

There were specimens from Yokohama in Pryer's collection. I obtained the species at Gensan, and have received it from Chang-yang and Kiukiang.

The differences between *planus* (=*argus*) and *ocellatus* indicated by Staudinger (Rom. sur Lép., vi, p. 236) do not hold good in my series from Japan, Corea, and North China when they are compared with European specimens. The Asiatic examples usually have the ocellus larger than those from Europe, but this is not invariably the case.

Distribution. EUROPE.—JAPAN; COREA; AMURLAND; NORTHERN and CENTRAL CHINA.

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40. *Smerinthus tatarinovii.*

Smerinthus tatarinovii, Brem. and Grey, Motsch. Etud. Ent., i, p. 62 (1852); Schmett. nörd. China, p. 13, (1853); Mén. Cat. Mus. Petr., pl. xiii, fig. 1 (1857).

Ambulyx tartarinovii, Swinhoe, Cat. Lep. Het. Oxford. p. 24 (1892).

Smerinthus eversmanni, Popoff, Bull. Mosc., 1854, ii, p. 182, pl. i, fig. 5.

There were specimens from Yokohama and Yesso in Pryer's collection, and I have received others from the same localities.

Among the specimens in Pryer's series there is one in which the primaries are suffused with pink, and the central band and apical patch are russet-brown, which would appear to be referable to to the form from Kiachta, for which Staudinger has proposed the varietal name *brunnea* (Rom. sur Lép., vi, p. 238). The larva feeds on *Ulmus campestris*.

Distribution. AMURLAND; SIBERIA; JAPAN; YESSO; NORTH CHINA.

Genus DAPHNUSA.

Walk., Cat. Lep. Het., viii, p. 237 (1856).

41. *Daphnusa colligata.*

Daphnusa colligata, Walk., Cat. Lep. Het., viii, p. 238 (1856).

Metagastes bieti, Oberth., Etud. d'Entom., xi, p. 29, pl. i, fig. 2 (1886).

A specimen in Pryer's collection; I have also received one example from Ichang and one from Kiukiang, taken in July. Walker's type was from N. China, and that of Oberthür's from Ta-chien-lu.

Distribution. NORTHERN, WESTERN, and CENTRAL CHINA; JAPAN.

Genus LEUCOPHLEBIA.

Westw., Cab. Orient. Ent., p. 46 (1848).

42. *Leucophlebia lineata.*

Leucophlebia lineata, Westw., Cab. Orient. Ent., p. 46, pl. xxii, fig. 2 (1848); Hampson, Fauna Brit. Ind., Moths, i, p. 74 (1892).

One specimen from Kiukiang.

Distribution. INDIA; CEYLON; JAVA (*Hampson*); CENTRAL CHINA.

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Subfamily *AMBULICINÆ*.

Genus AMBULYX.

West., Cab. Orient. Ent. p. 61 (1848).

43. *Ambulyx schauffelbergeri.*

Ambulyx schauffelbergeri, Brem. and Grey, Motsch. Etud. Ent., i, p. 62 (1852).
Ambulyx maculifera, Walk., Cat. Lep. Het., xxxv, p. 1851 (1866); Butl., Ill. Het., v, p. 10, pl. lxxx, fig. 3 (1881).
Ambulyx consanguis, Butl., Ill. Typ. Lep. Het., v, p. 11, pl. lxxx, fig. 4 (1881).
Ambulyx ochracea, Butl., Cist. Ent., iii, p. 113 (1885).
Ambulyx substrigilis (*part*), Hampson, Fauna Brit. Ind., Moths, i, p. 77 (1892).
Ambulyx trilineata, Rothschild, Novit. Zool., i, p. 88 (1894).

I took this species in June at Nagasaki, and my native collector obtained it at Nikko. There were examples from Yokohama in Pryer's collection. I have received specimens from Chia-ting-fu, Omei-shan, and Moupin, taken in June and July, some of which agree with the form described by Butler as *consanguis*. Most of the Japanese examples are referable to the form *ochracea*.

I have specimens from West China which seem to agree with *trilineata*, Rothschild from Kiushiu, but these are certainly not specifically distinct from *A. schauffelbergeri*.

Distribution. DARJILING; JAPAN; KIUSHIU; COREA; NORTHERN and WESTERN CHINA.

44. *Ambulyx japonica.*

Ambulyx japonica, Rothschild, Novit. Zool., i, p. 87 (1894); *op. cit.*, ii, pl. ix, fig. 6 (1895).

Described from Japan. Possibly a form of *A. schauffelbergeri*, Brem. and Grey. Alphéraky (Rom. sur Lép., ix, p. 166) records *A. japonica* from Corea.

Distribution. JAPAN; COREA.

Genus BASIANA.

Walk., Cat. Lep. Het., viii, p. 236 (1856).

45. *Basiana bilineata.*

Basiana bilineata, Walk., Cat. Lep. Het., Suppl., v, p. 1857 (1866); Kirby, Cat. Lep. Het., p. 702 (1892).

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Clanis bilineata, Butl., Ill. Typ. Lep. Het., v, p. 14, pl. lxxxi, fig. 4 (1881); Leech, Proc. Zool. Soc. Lond., 1888, p. 587.

Ambulyx bilineata, Hampson, Fauna Brit. Ind., Moths, i, p. 80 (1892).

Clanis undulosa, Moore, Proc. Zool. Soc. Lond., 1879, p. 387.

There were specimens from Yokohama in Pryer's collection, and I have received others from Kiukiang, taken in August, and also from Chang-yang and Moupin, where they were captured in July. Varies in size, colour, and marking.

Fixsen records the species from Corea.

Distribution. NORTHERN INDIA; EASTERN, CENTRAL, and WESTERN CHINA; COREA; JAPAN.

Subfamily *CHÆROCAMPINÆ.*

Genus AMPELOPHAGA.

Brem. and Grey, Motsch. Etud. Ent., i, p. 61 (1852).

46. *Ampelophaga rubiginosa.*

Ampelophaga rubiginosa, Brem. and Gray, Motsch. Etud. Ent., i, p. 61 (1852); Schmett. nōrd. China, p. 11 (1853); Hampson, Fauna Brit. Ind., Moths, i, p. 83 (1892).

Chærocampa rubiginosa, Mén., Cat. Mus. Petr., ii, p. 91, pl. xii, fig. 2 (1857).

Deilephila romanovi, Staud., Rom. sur Lép., iii, p. 158. pl. ix, figs. 1 a, b (1887).

There was a series, comprising specimens from Yokohama and Oiwake, in Pryer's collection. I have received the species from Ichang and Kiukiang, and from several localities in Western China.

Distribution. NORTH-WEST HIMALAYAS; SIKHIM; NÁGAS (*Hampson*); NORTHERN, EASTERN, CENTRAL, and WESTERN CHINA; COREA; AMURLAND; JAPAN.

Genus ACOSMERYX.

Boisd., Spec. Gén. Lép. Het., i, p. 214 (1875).

47. *Acosmeryx anceus.*

Sphinx anceus, Cram., Pap. Exot., iv, p. 124, pl. cccl v, fig. A (1781).

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Acosmeryx anceus, Butl., Trans. Zool. Soc. Lond., 1876, p. 544, pl. 90, figs. 11, 12 (larva and pupa).

Six specimens from Yokohama in Pryer's collection. I have one example from Kiukiang, taken in July.

Distribution. HIMALAYAS; NORTH-EAST INDIA; SOUTH INDIA; CEYLON; PENANG; BORNEO; JAVA; AMBOINA (*Hampson*); JAPAN; CENTRAL CHINA.

48. *Acosmeryx iyenobu.*

Acosmeryx iyenobu, Holl., Trans. Amer. Ent. Soc., xvi, p. 71 (1889).

I have not seen this species which Dr. Holland describes from Japan.

Hab. JAPAN.

49. *Acosmeryx naga.*

Philampelus naga, Moore, Cat. Lep. E. I. C., i, p. 271 (1857).

Acosmeryx naga, Kirby, Cat. Lep. Het., i, p. 649 (1892); Hampson, Fauna Brit. Ind., Moths, i, p. 83 (1892).

Acosmeryx metanaga, Butl., Ann. & Mag. Nat. Hist., (5) iv, p. 350 (1879).

There was a female specimen in Pryer's collection and my native collector obtained a male at Hakodate in June.

Alphéraky (Rom. sur Lép., ix, p. 167) records this species from Corea.

Distribution. NORTH-WEST and EASTERN HIMALAYAS (*Hampson*); JAPAN; YESSO; COREA.

Genus CHÆROCAMPA.

Dup., Lép. Fr., Suppl., ii, p. 159 (1835).

50. *Chærocampa elpenor.*

Sphinx elpenor, Linn., Syst. Nat., i, p. 491 (1758); Hübn., Sphing., fig. 61.

Theretra elpenor, Kirby, Cat. Lep. Het., p. 650 (1892).

Chærocampa macromera, Butl., Proc. Zool. Soc. Lond., 1875, p. 7; Ill. Typ. Lep. Het., v, p. 7, pl. lxxix, fig. 3, ♂ (1881).

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Chærocampa fraterna, Butl., P. Z. S., 1875, p. 247; I. T. L. H., v, p. 7, pl. lxxix, fig. 4, ♀ (1881).
Chærocampa lewisii, Butl., P. Z. S., 1875, p. 247.
Chærocampa elpenor, Leech, Proc. Zool. Soc. Lond., 1888, p. 584.

I obtained the species at Shimonoseki and Gensan in July; there were specimens from Oiwake in Pryer's collection and I have received others from Hakodate, also from Chang-yang, Kiukiang, Omei-shan and Wa-shan.

Japanese and Chinese specimens (*lewisii*, Butl.) are rather more rosy than, but do not otherwise differ from, European examples.

Distribution. EUROPE.—NORTHERN INDIA; NORTHERN, CENTRAL, and WESTERN CHINA; JAPAN; COREA; AMUR-LAND.

51. *Chærocampa oldenlandiæ.*

Sphinx oldenlandiæ, Fabr., Syst. Ent., p. 542 (1775).
Xylophanes oldenlandiæ, Moore, Lep. Ceyl., ii, p. 17, pl. lxxxv, fig. 85 (1882).
Xylophanes gortys, Hübn., Zutr. exot. Schmett, iii, p. 28, figs. 513, 514 (1825).
Theretra oldenlandiæ, Kirby, Cat. Lep. Het., p. 653 (1892).
Chærocampa oldenlandiæ, Hampson, Fauna Brit. Ind., Moths, i, p. 87 (1892).
Deilephila proxima, Austaut, Le Nat., 1892, p. 69.

A common species in Japan. Some specimens were bred in the Insect House at the Zoological Society's Garden, London, from pupæ which I brought from Yokohama, where I found the larva feeding commonly on taro and balsam.

I received several specimens from Ichang taken in August.

Austaut redescribes this species under the name "*D. proxima*," comparing it with *japonica*, Staud., no doubt intending *japonica*, Boisd. His description undoubtedly applies to *C. oldenlandiæ*, Fabr., to which he does not refer.

Distribution. EGYPT.—NORTHERN INDIA; CENTRAL CHINA; JAPAN.

52. *Chærocampa japonica.*

Chærocampa japonica, De l'Orza, Lép. Jap., p. 36 (1869); Boisd., Ins. Lép. Hét., i, p. 241 (1875).
Theretra japonica, Kirby, Cat. Lep. Het., p. 654 (1892).

Pryer refers to this species as common about Yokohama.

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I obtained it in Satsuma and at Nagasaki and Hakodate. Fixsen records specimens from Corea and I have examples from Kiukiang and Chang-yang.

Distribution. JAPAN; YESSO; KIUSHIU; COREA; CENTRAL CHINA.

53. *Chærocampa silhetensis.*

Chærocampa silhetensis, Walk., Cat. Lep. Het., viii, p. 143 (1858); Butl., Ill. Typ. Lep. Het., v, pl. lxxix, fig. 6.
Chærocampa bisecta, Moore, Cat. Lep. E. I. C., p. 278 (1857).
Theretra pinastrina, Mart.; Kirby, Cat. Lep. Het., i, p. 654 (1892).

I have one example from Kiukiang. Pryer obtained the species in the Loochoo islands.

Distribution. Throughout INDIA and CEYLON; JAVA; BORNEO; FORMOSA; JAPAN (*Hampson*); CENTRAL CHINA; LOOCHOO.

54. *Chærocampa clotho.*

Sphinx clotho, Drury, Exot. Ins., ii, pl. xxviii, fig. 1 (1773).
Hathia clotho, Moore, Lep. Ceyl., ii, p. 20, pl. lxxvii, fig. 1 (1882).
Theretra clotho, Kirby, Cat. Lep. Het., p. 655 (1892).
Chærocampa butus, Cram.; Hampson, Fauna Brit. Ind., Moths. i, p. 93 (1892).

I obtained a specimen in Satsuma in the month of May.

Distribution. Throughout INDIA, CEYLON, and BURMA; ANDAMANS; BORNEO; JAVA; KIUSHIU.

55. *Chærocampa lineosa.*

Chærocampa lineosa, Walk., Cat. Lep. Het., viii, p. 144 (1856); Butl., Ill. Typ. Het.,v, p. 9, pl. lxxix, fig. 7 (1881); Hampson, Fauna Brit. Ind., Moths, i, p. 93 (1892).
Theretra lineosa, Kirby, Cat. Lep. Het., p. 656 (1892).

Two specimens from Omei-shan and one from Chang-yang, taken in July.

Distribution. MUSSOOREE; SIKHIM; ASSAM; SYLHET (*Hampson*); CENTRAL and WESTERN CHINA.

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56. *Chærocampa striata.*

Theretra striata, Rothschild, Novit. Zool., i, p. 76 (1894).

Rothschild states that this species is closely allied to *C. lineosa*, Walk., but is different in pattern and is barely three-fifths the size.

Hab. JAPAN.

Genus DEILEPHILA.

Ochs., Schmett. Eur., iv, p. 42 (1816).

57. *Deilephila livornica.*

Sphinx livornica, Esp., Schmett., ii, p. 196 (1779); ii, (2), p. 41, pl. xlvi, figs. 3–7 (1789 ?).

Dilephila livornica, Hampson, Fauna Brit. Ind., Moths, i, p. 97 (1892).

Deilephila livornica, Kirby, Cat. Lep. Het., p. 664 (1892).

A series of bred specimens from Wa-shan, July. In these the oblique band of the forewings is narrower than in typical European examples.

Distribution. EUROPE.—NORTH AFRICA.—NORTH-WEST HIMALAYAS; WESTERN CHINA.

58. *Deilephila galii.*

Sphinx galii, Rott., Naturf., viii, p. 107 (1775).

Dilephila galii, Hampson, Fauna Brit. Ind., Moths, i, p. 98 (1892).

Deilephila galii, Kirby, Cat. Lep. Het., p. 665 (1892).

Two specimens in Pryer's collection, one of which was taken in June at Fujisan. I observed an example at Tsuruga in July; this was hovering over flowers in the sunshine. I have also seen this species on the wing, in the day time, in Kashmir.

Distribution. EUROPE.—AMURLAND; JAPAN; KASHMIR.

59. *Deilephila euphorbioides.*

Deilephila euphorbioïdes, Swinhoe, Cat. Lep. Het. Oxford, p. 22 (1892).

Described from a Japanese specimen in the Oxford Museum. I have not seen this species, which Swinhoe states to be intermediate between *D. biguttata*, Walk., and *D. euphorbiæ*.

Hab. JAPAN.

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Genus THERETRA.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i. p. 99 (1892).

60. *Theretra nessus.*

Sphinx nessus, Drury, Exot. Ins., ii, p. 46, pl. xxvii, fig. 1 (1773).
Sphinx equestris, Fabr., Ent. Syst., iii, p. 365 (1793).
Theretra nessus, Kirby, Cat. Lep. Het., p. 659 (1892); Hampson, Fauna Brit. Ind., Moths, i, p. 99 (1892).
Chærocampa nessus, Swinhoe, Cat. Lep. Het. Oxford, p. 18 (1892).

There was a fine series from Yokohama in Pryer's collection. My native collector obtained the species in the island of Kiushiu.

Distribution. HONG-KONG; throughout INDIA, CEYLON, and BURMA; BORNEO; JAVA (*Hampson*); JAPAN; KIUSHIU.

Genus METOPSILUS.

Dunc., Nat. Libr., Brit. Moths, p. 154 (1836).

61. *Metopsilus mongolianus.*

Pergesa mongoliana, Butl., Proc. Zool. Soc. Lond., 1875, p. 622; Ill. Typ. Lep. Het., ii, p. 4, pl. xxi, fig. 5 (1878).
Metopsilus mongolianus, Kirby, Cat. Lep. Het., p. 660 (1892).

Common at Yokohama. I have one specimen from Kiukiang. Probably a form of *M. velatus*, Walk.

Distribution. JAPAN; COREA; NORTHERN and CENTRAL CHINA.

Subfamily *SPHINGINÆ.*

Genus PROTOPARCE.

Burmeister; Hampson, Fauna Brit. Ind., Moths, i, p. 103 (1892).

62. *Protoparce convolvuli.*

Sphinx convolvuli, Linn., Syst. Nat., i, p. 490 (1758); Hübn., Sphing., fig. 70.
Protoparce orientalis, Butl., Trans. Zool. Soc. Lond., ix, p. 609, pl. xci, figs. 16, 17, larva and pupa (1876).

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Protoparce convolvuli, Hampson, Fauna Brit. Ind., Moths, i, p. 103 (1892).
Phlegethontius convolvuli, Kirby, Cat. Lep. Het., p. 690 (1892).

There were four specimens from Yokohama in Pryer's collection. I obtained the species at Fushiki and Hakodate, in Japan. My collectors met with it at Chang-yang and Ichang in Central China, and at Chung-King in Western China.

Distribution. EUROPE.—ASIA.—AFRICA.—AUSTRALIA.

Genus SPHINX.

Linn., Syst. Nat., i, p. 489 (1758).

63. *Sphinx ligustri.*

Sphinx ligustri, Linn., Syst. Nat., i, p. 490 (1758); Hübn., Sphing., pl. xiv, fig. 69.
Sphinx constricta, Butl., Cist. Ent., iii, p. 113 (1885).
Sphinx ligustri, var. *amurensis*, Oberth., Bull. Soc. Ent. Fr., (6) vi, p. 741 (1886).

A native collector obtained one specimen at Hakodate in June. Var. *amurensis*, Oberth. would appear to be identical with the Japanese form described as *constricta* by Butler.

Distribution. EUROPE.—JAPAN; YESSO; MANCHURIA; NORTH CHINA; AMURLAND.

Genus HYLOICUS.

Hübn., Verz. Schmett., p. 139 (1822 ?).

64. *Hyloicus pinastri.*

Sphinx pinastri, Linn., Syst. Nat., i, p. 492 (1758); Hübn., Sphing., fig. 67.
Hyloicus pinastri, Kirby, Cat. Lep. Het., p. 693 (1892).
Hyloicus caligineus, Butl., Ann. & Mag. Nat. Hist., (4) xx, p. 393 (1877); Ill. Typ. Lep. Het., ii, p. 2, pl. xxi, fig. 6 (1878).
Anceryx pinastri, Leech, Proc. Zool. Soc. Lond., 1888, p. 588.

Typical specimens occur in Japan, but the more common form is *caligineus*, Butl. It appears to be double brooded;

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I obtained the species at Ningpo in April and again in various parts of Japan in July.

Distribution. EUROPE. — JAPAN; KIUSHIU; EASTERN CHINA.

Genus PSEUDOSPHINX.

Burmeister; Hampson, Fauna Brit. Ind., Moths, i, p. 104 (1892).

65. *Pseudosphinx increta.*

Anceryx increta, Walk., Cat. Lep. Het., Suppl., i, p. 36 (1864).

Diludia increta, Butl., Ill. Typ. Lep. Het., iii, p. 4, pl. xli, fig. 7 (1879).

Meganoton increta, Kirby, Cat. Lep. Het., p. 682 (1892).

Pseudosphinx discistriga (*part*), Hampson, Fauna Brit. Ind., Moths, i, p. 105 (1892).

Common in Japan. I have received specimens from Ichang, Kiukiang, and Omei-shan. Taken in July and August.

Walker's type is in very bad condition; my specimens agree very well with Butler's figure.

Distribution. NORTHERN, CENTRAL, EASTERN and WESTERN CHINA; JAPAN; LOOCHOO; NORTHERN INDIA.

66. *Pseudosphinx analis.*

Sphinx analis, Feld., Reise Nov., Lep., iv, pl. lxxviii, fig. 4 (1874).

Meganoton analis, Kirby, Cat. Lep. Het., i, p. 682 (1892).

Possibly a form of *P. increta*, Walk., but as I have only seen Felder's figure I am unable to form any definite conclusion on this point.

Hab. SHANGHAI.

67. *Pseudosphinx discistriga.*

Macrosila discistriga, Walk., Cat. Lep. Het., viii, p. 208 (1856).

Diludia discistriga, Butl., Ill. Typ. Lep. Het., iii, p. 3, pl. xli, fig. 6 (1879).

Diludia melanomera, Butl., Proc. Zool. Soc. Lond., 1875, p. 13; Trans. Zool. Soc. Lond., ix, p. 615, pl. xciv, fig. 4 (1876).

Pseudosphinx discistriga, Hampson, Fauna Brit. Ind., Moths, i, p. 105 (1892).

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One specimen from Ichang taken in August. This agrees well with Butler's figure except in its larger size.

Distribution. SYLHET; EAST INDIES; BORNEO; JAVA; NORTHERN, CENTRAL, and SOUTHERN CHINA.

Genus DOLBINA.

Staud., Rom. sur Lép., iii, p. 155 (1887).

68. *Dolbina tancrei.*

Dolbina tancrei, Staud., Rom. sur Lép., iii, p. 155, pl. xvii, fig. 8 (1887); Kirby, Cat. Lep. Het., p. 685 (1892).

Pseudosphinx inexacta, Leech, Proc. Zool. Soc. Lond., 1888, p. 588.

Pryer in his catalogue refers to this species as occurring among yew trees. There were several specimens in his collection and I obtained five examples at Hakodate in August.

The olivaceous coloration and markings of thorax separate this species from *D. inexacta* with which I formerly confused it.

Distribution. AMURLAND; JAPAN; YESSO.

69. *Dolbina inexacta.*

Macrosila inexacta, Walk., Cat. Lep. Het., viii, p. 208 (1856).

Pseudosphinx inexacta, Butl., Ill. Typ. Lep. Het., v, p. 16, pl. lxxxi, fig. 8 (1881); Hampson, Fauna Brit. Ind., Moths, i, p. 104 (1892).

Hyloicus inexacta, Kirby, Cat. Lep. Het., i, p. 694 (1892).

One specimen taken in July at Chang-yang.

This species is readily distinguished from *D. exacta*, Staud., by the white coloration on under surface of abdomen being traversed by an interrupted black stripe.

Distribution. MUSSOORIE; KHÁSIS; BOMBAY (*Hampson*); CENTRAL CHINA.

Genus KENTROCHRYSALIS.

Staud., Rom. sur Lép., iii, p. 157 (1887).

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70. KENTROCHRYSALIS STRECKERI.

Sphinx streckeri, Staud., Ent. Nachr., vi, p. 252 (Nov. 1880); Rom. sur Lép., iii, p. 157 (1887).
Sphinx davidis, Oberth., Etud. d'Entom., v, p. 27, pl. vii, fig. 9 (Dec. 1880).
Hyloicus davidis, Butl., Trans. Ent. Soc. Lond., 1881, p. 2.
Anceryx davidis, Leech, Proc. Zool. Soc. Lond., 1888, p. 589.
Kentrochrysalis streckeri, Staud., Rom. sur Lép., vi, p. 220 (1892).

There were three specimens from Yokohama in Pryer's collection; these were found on stems of yew trees. This species has also been recorded from Tokio and Nikko.
Distribution. JAPAN; ASKOLD; AMURLAND.

71. *Kentrochrysalis sieversi.*

Kentrochrysalis sieversi, Alph., Rom. sur Lép., ix, p. 164, pl. x, fig. 1 ♂ (1897).

Alphéraky describes *K. sieversi* from Corea. The example figured by him does not seem to differ from *K. streckeri*, except that it is larger and darker, and the markings are more pronounced. One of my Japanese specimens of the last-named species is very much darker than *sieversi*, and the markings are quite as strongly developed, but I cannot see any reason for considering it as specifically distinct from *K. streckeri*.
Hab. COREA.

Subfamily *MACROGLOSSINÆ.*

Genus CINOGON.

Butl., Trans. Ent. Soc. Lond., 1881, p. 1.

72. *Cinogon askoldensis.*

Smerinthus askoldensis, Oberth., Etud. d'Entom., v, p. 25, pl. i, fig. 3 (1880).
Cinogon cingulatum, Butl., Trans. Ent. Soc. Lond., 1881, p. 2.
Cinogon askoldensis, Kirby, Cat. Lep. Het., p. 639 (1892).

There were specimens from Oiwake and Yesso in Pryer's collection. Butler's type was from Tokio.
Distribution. AMURLAND; JAPAN; YESSO; ASKOLD.

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Genus GURELCA.

Kirby, Proc. Roy. Dubl. Soc., (2) ii, p. 330 (1880).

73. *Gurelca hyas.*

Lophura hyas, Walk., Cat. Lep. Het., viii, p. 107 (1856).
Gurelca hyas, Hampson, Fauna Brit. Ind., Moths, i, p. 110 (1892); Alph., Rom. sur Lép., vi, p. 3, pl. i, fig. 2 (1892).
Lophura sangaica, Butl., Proc. Zool. Soc. Lond., 1875, p. 621.
Gurelca sangaica, Kirby, Cat. Lep. Het., p. 643 (1892).

Common in Japan from May to August. I have received the species from Gensan and also from Kiukiang, Chang-yang, Moupin, and Huang-mu-chang. Examples from the North-western Himalayas in my collection agree with Japanese specimens.

Distribution. HONGKONG; SIKHIM; SYLHET; MHOW; JAVA (*Hampson*); NORTH-WEST HIMALAYAS; JAPAN; KIUSHIU; COREA; EASTERN, CENTRAL, and WESTERN CHINA.

74. *Gurelca masuriensis.*

Lophura masuriensis, Butl., Proc. Zool. Soc. Lond., 1875, p. 244, pl. xxxvi, fig. 3; Alph., Rom. sur Lép., ix, p. 119 (1897).
Gurelca masuriensis, Hampson, Fauna Brit. Ind., Moths, i, p. 110 (1892).

Alphéraky records a male specimen from Sé-Tchouen.

Distribution. MUSSOORIE; NORTH-EASTERN HIMALAYAS (*Hampson*); WESTERN CHINA.

Genus RHOPALOPSYCHE.

Butl., Proc. Zool. Soc. Lond., 1875, p. 239.

75. *Rhopalopsyche nycteris.*

Macroglossa nycteris, Koll., Hügel. Kaschm., iv (2), p. 458, pl. xix, fig. 5 (1844).
Rhopalopsyche nycteris, Hampson, Fauna Brit. Ind., Moths, i, p. 111 (1892); Kirby, Cat. Lep. Het., p. 634 (1892).

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I have specimens from Chang-yang, Wa-shan, Chia-ting-fu, and Chia-kou-ho, taken in July.

Distribution. HIMALAYAS; KHÁSIS; BURMA (*Hampson*); CENTRAL and WESTERN CHINA.

Genus MACROGLOSSA.

Scop.; Hampson, Fauna Brit. Ind., Moths, i, p. 112 (1892).

76. *Macroglossa stellatarum.*

Sphinx stellatarum, Linn., Syst. Nat., i, p. 495 (1758); Hübn., Sphing., pl. ix, fig. 57.

Macroglossa stellatarum, Hampson, Fauna Brit. Ind., Moths, i, p. 113 (1892); Kirby, Cat. Lep. Het., p. 629 (1892).

Fairly common in Japan and Yesso; I have received the species from Huang-mu-chang.

Distribution. EUROPE.—NORTH AFRICA.—NORTHERN ASIA; EASTERN, CENTRAL, WESTERN and NORTHERN CHINA; AMURLAND; COREA.

77. *Macroglossa belis.*

Sphinx belis, Cram., Pap. Exot., i, p. 147, pl. xciv, fig. c (1776).

Macroglossa belis, Hampson, Fauna Brit. Ind., Moths, i, p. 113 (1892).

My collectors did not obtain this species in any part of China that they visited.

Distribution. CHINA and throughout INDIA and CEYLON (*Hampson*).

78. *Macroglossa bombylans.*

Macroglossa bombylans, Boisd., Sp. Gén. Lép., i, p. 334 (1875); Kirby, Cat. Lep. Het., p. 630 (1892).

Macroglossa walkeri, Butl., Proc. Zool. Soc. Lond., 1875, p. 4; Hampson, Fauna Brit. Ind., Moths, i, p. 116 (1892).

I obtained this species in Satsuma in May, at Nikko and Oiwake in September and October; and I have received it from Kiukiang, Chang-yang, and from several localities in Western China.

Distribution. HIMALAYAS and throughout NORTH INDIA (*Hampson*); JAPAN; CENTRAL and WESTERN CHINA.

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79. *Macroglossa gilia.*

Macroglossa gilia, Herr.-Schäff., Schmett., pp. 59, 79, pl. xxiii, fig. 107; Hampson, Fauna Brit. Ind., Moths, i. p. 117 (1892); Alph., Rom. sur Lép., ix, p. 119 (1897).

Alphéraky records three specimens, taken at the end of July, at Ja-djòou, in Sé-Tchouen.

Distribution. Throughout INDIA and CEYLON; JAVA (*Hampson*); WESTERN CHINA.

80. *Macroglossa pyrrhosticta.*

Macroglossa pyrrhosticta, Butl., Proc. Zool. Soc. 1875, p. 242, pl. xxxvi, fig. 8.

I took this species at Nagahama and Gensan in June and July; Pryer records it from Yokohama. My collectors obtained specimens at Chang-yang, Kiukiang, and at several localities in Western China. The type was from Shanghai.

Distribution. EASTERN, CENTRAL, and WESTERN CHINA; JAPAN; KIUSHIU; COREA; LOOCHOO ISLANDS.

81. *Macroglossa saga.*

Macroglossa saga, Butl., Ent. Mo. Mag., xiv, p. 206 (1878); Ill. Typ. Lep. Het., ii, p. 1, pl. xxi, fig. 1 (1878).

Macroglossa kiushiuensis, Rothschild, Novit. Zool., i, p. 66 (1894); *op. cit.*, iii, pl. xiii, fig. 2 (1896).

Described from Yokohama. I have not received any Japanese specimens, but there were some examples from Loochoo in Pryer's collection.

M. saga may be separated from its near ally *M. pyrrhosticta* by the uninterrupted black basal patch of the secondaries and by its greater size, and the rather different character of the apical markings of the primaries.

Distribution. JAPAN; KIUSHIU; LOOCHOO.

82. *Macroglossa passalus.*

Sphinx passalus, Drury, Ill. Exot. Ent., ii, pl. xxix, fig. 2 (1773).

Macroglossa passalus, Kirby, Cat. Lep. Het., p. 632 (1892).

Macroglossa proxima, Butl., Proc. Zool. Soc. Lond., 1875, p. 4, pl. 1, fig. 1; Hampson, Fauna Brit. Ind., Moths i, p. 114 (1892).

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One specimen from Moupin, June; two from Changyang, July; and one from Ichang Gorge, September.

Distribution. SYLHET; CACHAR; KANARA; CEYLON; TENASSERIM; MALACCA (*Hampson*); CENTRAL and WESTERN CHINA.

Genus SPHECODINA.

Blanch., Hist. Nat. Ins., iii, pl. xx, fig. 4 (1840).

83. *Sphecodina* (?) *caudata.*

Thyreus caudata, Brem. and Grey, Motsch. Etud. Ent., i, p. 62 (1852); Mén., Cat. Mus. Petr., ii, p. 95, pl. xii, fig. 4 (1857).

Sphecodina (?) *caudata*, Kirby, Cat. Lep. Het., p. 638 (1892).

The type of this species was from Pekin. My collectors did not meet with it in any part of China that they visited. Staudinger (Rom. sur Lép., vi, p. 238) records specimens from Amurland, and gives a description of a coloured figure of the larva.

Distribution. NORTH CHINA; AMURLAND.

Genus SATASPES.

Moore, Cat. Lep. E. I. C., i, p. 261 (1857).

84. *Sataspes infernalis.*

Sesia infernalis, Westw., Cab. Orient. Ent., p. 61, pl. xxx, fig. 3 (1848).

Sataspes infernalis, Leech, Trans. Ent. Soc. Lond., 1889, p. 121; Hampson, Fauna Brit. Ind., Moths, i, p. 121, (1892).

Sataspes xylocoparis, Butl., Proc. Zool. Soc. Lond., 1875, p. 239, pl. xxxvi, fig. 1.

I received this species from Ichang, Kiukiang, Chiating-fu, and Moupin; fifteen specimens in all, taken in June and July. Butler's type was from Shanghai.

Distribution. SIKHIM; SYLHET; BURMA; HONG-KONG (*Hampson*); EASTERN, CENTRAL and WESTERN CHINA.

Genus HEMARIS.

Dalm., Vet. Akad. Handl., p. 207 (1816).

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85. *Hemaris radians.*

Sesia radians, Walk., Cat. Lep. Het., viii, p. 84 (1856).
Hemaris radians, Butl., Ill. Typ. Lep. Het., ii, p. 1, pl. xxi, fig. 2 (1878).
Hemaris mandarina, Butl., Proc. Zool. Soc. Lond., 1875, p. 239, pl. xxxv. fig 2.

There were specimens from Oiwake and Yokohama in Pryer's collection. I took the species at Gensan, Fushiki and Hakodate, and have received examples from Kiukiang.

The rays from the outer marginal border, which are conspicuous in the type form, are altogether absent in *mandarina*, and all gradations between these extremes are exhibited.

Distribution. JAPAN; YESSO; COREA; EASTERN, CENTRAL, and NORTHERN CHINA.

86. *Hemaris alternata.*

Sesia alternata, Butl., Ann. and Mag. Nat. Hist., (4) xiv, p. 366 (1874).
Hemaris alternata, Butl., Ill. Typ. Lep. Het., ii. p. i, pl. xxi, fig. 3 (1878).

According to Pryer, this species would seem to be common about Yokohama; it is recorded from Oiwake and Hakodate, and I obtained specimens at Gensan in July. My native collectors captured four examples at Chang-yang.

Fixsen (Rom. sur Lép., iii, p. 323) suggests that *H. alternata* may be referable to *H. affinis*, but the former is easily separable from the latter.

Distribution. JAPAN; YESSO; COREA; CENTRAL CHINA.

87. *Hemaris affinis.*

Macroglossa affinis, Brem., Bull. Acad. Pétrsb., iii, p. 559 (1861); Lep. Ost-Sib., p. 35, pl. iii, fig. 13 (1864).
Macroglossa sieboldi, Boisd., de l'Orza, Lép. Jap., p. 35 (1869).
Sesia whitelyi, Butl., Ann. and Mag. Nat. Hist., (4) xiv, p. 367 (1874).

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There were specimens from Gifu and Yokohama, in Pryer's collection. I received examples from Hakodate, where they were captured in June.

Distribution. JAPAN; YESSO; AMURLAND; NORTH CHINA.

88. *Hemaris beresowskii.*

Hemaris beresowskii, Alph., Rom. sur Lép., ix, p. 120, pl. xii, fig. 9 ♂ (1897).

Alphéraky describes this species, which is closely allied to *H. affinis*, Brem., from Sé-Tchouen. I received two male specimens from Ta-chien-lu, one from Pu-tsu-fong, one from Kia-tung-fu, and a female from Kwei-chow; all these were taken in June and July.

Hab. WESTERN CHINA.

89. *Hemaris staudingeri.*

Hemaris staudingeri, Leech, Entom., xxiii, p. 81 (1890).

Eight specimens from Chang-yang taken in July.

Hab. CENTRAL CHINA.

Genus CEPHONODES.

Hübn., Verz. Schmett., p. 131 (1816).

90. *Cephonodes hylas.*

Sphinx hylas, Linn., Mant., i, p. 539 (1771).
Sesia hylas, Don., Ins. China, ii, pl. xliii, fig. 2 (1799).
Sphinx picus, Cram., Pap. Exot., ii, p. 83, pl. cxlviii, fig. B. (1777).
Hemaris hylas, Saalm., Lep. Madag., i, p. 117, pl. iii. fig. 40 (1884).
Cephonodes hylas, Leech, Proc. Zool. Soc. Lond., 1888, p. 581.

There were six specimens from Yokohama in Pryer's collection. I obtained the species in Satsuma in May, and at Nagasaki in May and June; I have also received specimens from Chia-ting-fu and Moupin.

Distribution. Throughout INDIA to AUSTRALIA.—WEST and SOUTH AFRICA (*Hampson*).—JAPAN; KIU-SHIU; LOOCHOO ISLANDS; WESTERN CHINA.

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Family NOTODONTIDÆ.

Genus TARSOLEPIS.

Butl., Ann. and Mag. Nat. Hist., (4) x, p. 125 (1872).

91. *Tarsolepis sommeri.*

Crino sommeri, Hübn., Samml. Ex. Schmett. (1824 ?).
Tarsolepis remicauda, Butl., Ann. and Mag. Nat. Hist., (4) x, p. 125, pl. viii. (1872); Hampson, Fauna Brit. Ind., Moths, i, p. 127 (1892).
Tarsolepis sommeri, Kirby, Cat. Lep. Het., p. 616 (1892).

There was a very poor example of this species, without data, in Pryer's collection. I am informed by Mr. A. E. Wileman that it is not uncommon at light in some parts of Japan.

Distribution. SIKHIM; BORNEO (*Hampson*); JAPAN.

Genus DUDUSA.

Walk., Cat. Lep. Het., xxxii, p. 446 (1865).

92. *Dudusa nobilis.*

Dudusa nobilis, Walk., Cat. Lep. Het., xxxii, p. 447 (1865).

Walker described this species, with which I am not acquainted, from "North China."

Hab. NORTH CHINA.

Genus NADATA.

Walk., Cat. Lep. Het., v, p. 1062 (1855).

93. *Nadata cristata.*

Trabala cristata, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 480 (1877); Ill. Typ. Lep. Het., ii, p. 18, pl. xxvii, fig. 1 (1878).
Nadata cristata, Kirby, Cat. Lep. Het., p. 614 (1892).

Specimens from Oiwake and Yokohama were in Pryer's collection. I took the species at Nagahama in July; Oberthür records it from the isle of Askold and Staudinger from Amurland and North of Pekin.

Distribution. JAPAN; AMURLAND; ASKOLD; NORTH CHINA.

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94. *Nadata niveiceps.*

Trabala niveiceps, Walk., Cat. Lep. Het., xxxii, p. 554 (1865).
Nadata niveiceps, Butl., Ill. Typ. Lep. Het., vi, p. 21, pl. civ, fig. 8 (1886); Hampson, Fauna Brit. Ind., Moths, i, p. 130 (1892).

One example of each sex taken in July at Wa-shan. In the male the primaries have an indistinct wavy subbasal line and medial and postmedial elbowed lines; both sexes have a pale yellow spot in the discal cell.

Distribution. North-West Himalayas (*Hampson*); Western China.

95. *Nadata splendida.*

Trabala splendida, Oberth., Etud. d'Entom., v, p. 65, pl. v, fig. 6 (1881).
Nadata splendida, Staud., Rom. sur Lép., vi, p. 366 (1892).

I have one specimen from Chang-yang.

Staudinger, in referring to this species from the Isle of Askold and Amurland, states that the larva, which is almost uniformly greenish white, feeds upon oak.

Distribution. Askold; Amurland; Central China.

Genus Phalera.

Hübn., Verz. Schmett., 146 (1816).

96. *Phalera fuscescens.*

Phalera fuscescens, Butl., Trans. Ent. Soc., 1881, p. 597.
Phalera staudingeri, Alph., Iris, viii, p. 187 (1895).

There were two specimens, from Oiwake and Fujisan, in Pryer's collection and I obtained one example at Gensan in July.

Alphéraky describes this species from Amurland under the name *staudingeri;* his excellent description of the latter exactly applies to *P. fuscescens*, Butl., which he was evidently not acquainted with as he does not refer to it.

Distribution. Japan; Corea; Amurland.

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97. *Phalera alpherakyi*, sp. n.

♂ Primaries fuscous-grey with several blackish, wavy, transverse lines; the most prominent of the markings are the double line limiting the pale grey basal area, a single one just beyond the cell, and a double one from the white edged ochreous, somewhat cuneiform apical patch; there is a blackish lunule surrounded with whitish at end of cell and a lunulate, blackish, sub-marginal line; the latter is spotted with black between veins 1—4; fringes reddish-brown. Secondaries fuscous with a ill-defined pale band just beyond the middle; fringes whitish marked with reddish-brown at ends of the nervures. Under surface: primaries have the basal three-fourths blackish, the outer limit defined by an oblique darker line; the outer third of the wing is pale ochreous with a large diffuse blackish patch, traversed by a wavy pale ochreous line, between veins 6 and inner margin: secondaries whitish suffused with fuscous on basal area, which is limited by a blackish band, and on outer fourth except towards outer angle.

Expanse. 58–64 millim.

Two male specimens from Pu-tsu-fong, taken in June or July.

Allied to *P. assimilis*, Brem.

98. *Phalera sigmata.*

Phalera sigmata, Butl., Ann. and Mag. Nat. Hist., (4), xx, p. 473 (1877); Ill. Typ. Lep. Het., ii, pl. xxiv, fig. 9 (1878); Leech, Proc. Zool. Soc. Lond., 1888, p. 641.

A nice series in Pryer's collection from Yokohama. I have one example from Omei-shan which was taken in June or July. Butler's female type was from Hakodate.

Distribution. JAPAN; YESSO; WESTERN CHINA.

99. *Phalera flavescens.*

Phalera flavescens, Brem., Lep. Nörd. China, p. 14 (1853).
Trisula andreas, Oberth., Etud. d'Entom., v, p. 38, pl. v, fig. 4 (1880).
Trisula (*Phalera*) *flavescens*, Staud., Rom. sur Lép., vi, p. 368 (1892).

Oberthür places this species in *Trisula* and so also does Staudinger with the remark that he is unable to ascertain where the genus was characterised.

Trisula was founded by Moore (Cat. Lep. E.I.C., ii, p. 420) for the reception of *variegata*, Moore, which Hamp-

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son (Fauna Brit. Ind., Moths, i, p. 430) states is a Noctua.

There were specimens in Pryer's collection from Yesso and Yokohama. I obtained the species at Gensan and my native collector at Hakodate; I have also received one example from Moupin.

Graeser states that the larva resembles that of *P. bucephala* and feeds on birch.

Distribution. JAPAN; YESSO; COREA; AMURLAND; ASKOLD; NORTHERN and WESTERN CHINA.

100. *Phalera assimilis.*

Pygæra assimilis, Brem. and Grey, Motsch. Etud. d'Ent., i, p. 30 (1852); Schmett. nörd. China, p. 16 (1853).

Phalera assimilis, Kirby, Cat. Lep. Het., i, p. 577 (1892); Alphéraky, Rom. sur Lép., ix, p. 156, pl. xi, fig. 4 (1897).

Phalera ningpoana, Feld., Wien. Ent. Mon., vi, p. 37 (1862).

One male specimen from Omei-shan and a female from Wa-shan; both taken in July.

Distribution. NORTHERN and WESTERN CHINA.

Genus EDEMA.

Walker, Cat. Lep. Het., v, p. 1028 (1855).

101. *Edema nivilinea.*

Edema nivilinea, Leech, Proc. Zool. Soc. Lond., 1888, p. 638, pl. xxxii, fig. 1.

There were two specimens from Oiwake in Pryer's collection and three others, without locality, among his unarranged material.

Hab. JAPAN.

Genus PYDNA.

Walk.; Hampson, Fauna Brit. Ind., Moths, i, p. 138 (1892).

102. *Pydna plumosa.*

Bireta plumosa, Leech, Proc. Zool. Soc. Lond., 1888, p. 620, pl. xxxi, fig. 4.

This species was taken by Pryer at Ohoyama.

Hab. JAPAN.

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103. *Pydna southerlandii.*

Bireta southerlandii, Holland, Trans. Amer. Ent. Soc., xvi, p. 73 (1889).

I have several specimens comprised in my variable series of *P. straminea* which appear to agree fairly well with the description of *P. southerlandii*; but without seeing the type of the latter I am unable to form any definite conclusion.

Hab. JAPAN.

104. *Pydna straminea.*

Ceira straminea, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 91 (1877).

Specimens from Yokohama in Pryer's collection. I obtained the species at Gensan in June and have received it from Kiushiu.

Distribution. JAPAN; KIUSHIU; COREA; EASTERN CHINA.

105. *Pydna pallida.*

Bireta pallida, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 473 (1877); Ill. Typ. Lep. Het., ii, p. 12, pl. xxv, figs. 10, 11 (1878).

Pydna pallida, Hampson, Fauna Brit. Ind., Moths, i, p. 140 (1892).

There was a good series from Yokohama in Pryer's collection.

Distribution. SIKHIM; CHEKIANG (*Hampson*); JAPAN.

106. *Pydna insignis*, sp. n.

Primaries pale buff clouded and suffused with purplish-brown on inner, central and outer marginal areas; there are two black dots at the base of the wing, a transverse series of four dots before the middle, a mark at end of the cell followed by a wavy and curved line with a double dentated line beyond dotted with black on the nervules, there is a series of black dots between the nervules on outer marginal area; the apices are marked with darker purplish-brown. Secondaries fuscous paler on costal area. Fringes of the ground colour marked with darker. Under surface fuscous pale buff on costal and apical areas of primaries and on costal area of secondaries.

Expanse 54 to 74 millim.

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I have three male specimens from Omei-shan, one from Pu-tsu-fong and one from Chang-yang taken in June and July.

Hab. CENTRAL and WESTERN CHINA.

In some examples the transverse markings of the primaries are almost obsolete.

107. *Pydna frugalis*, sp. n.

♂ Primaries whitish-brown speckled with blackish on basal area; there is a rufous streak in cell, its widest extremity enclosing the dark discal mark; another rufous streak extends obliquely from apex almost to median nervure, between the termination of this streak and the inner margin there are two curved streaks the first of which is rufous and the other dusky; beyond the middle of the wing there is a double series of black points, the series curved towards inner margin; black internervular dots on outer margin. Secondaries whitish-brown. Fringes of the ground colour. Under surface paler than above and slightly tinged with ochreous about costal area of primaries.

♀ Primaries browner, the markings less distinct, but with a conspicuous black spot below the median nervure.

Expanse ♂ 42 millim ♀ 50 millim.

One male specimen from Pu-tsu-fong and a female from Moupin, June.

Hab. WESTERN CHINA.

Genus NORRACA.

Moore, Proc. Zool. Soc. Lond., 1881, p. 340.

108. *Norraca retrofusca.*

Norraca retrofusca, Joannis, Bull., Soc. Ent. Fr., 1894, p. clx.

Described from a male specimen taken at Kiang-nan.

Hab. EASTERN CHINA.

Genus ANTICYRA.

Walk., Cat. Lep. Het., v, p. 1091 (1855).

109. *Anticyra combusta.*

Anticyra combusta, Walk., Cat. Lep. Het., v, p. 1092 (1855); Hampson, Fauna Brit. Ind., Moths, i, p. 145 (1892).

One male specimen from Ichang, taken in June.

Distribution. PHILIPPINES; N. W. HIMALAYAS; INDIA; JAVA; CENTRAL CHINA.

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Genus DRYMONIA.

Hübn., Verz. Schmett, p. 144 (1822 ?).

110. *Drymonia chaonia.*

Bombyx chaonia, Hübn., Bomb., pl. iii, figs. 10, 11 (1800 ?).
Drymonia ruficornis, Hübn.; Kirby, Cat. Lep. Het., p. 570 (1892).

There were several specimens from Gifu in Pryer's collection. They agree fairly well with some of my European examples.

Distribution. EUROPE.—JAPAN.

111. *Drymonia trimacula.*

Bombyx trimacula, Esp., Schmett., iii, p. 242, pl. xlvi, figs. 1–3 (1785).
Drymonia trimacula, Kirby, Cat. Lep. Het., p. 571 (1892).
Notodonta trimacula, var. *dodonides*, Staud., Rom. sur Lép., iii, p. 220 (1887).

There was a rather damaged specimen in Pryer's collection, which is undoubtedly referable to this species. Staudinger records a form from Amurland under the name *dodonides*.

Distribution. EUROPE.—AMURLAND; JAPAN.

112. *Drymonia manleyi.*

Drymonia manleyi, Leech, Proc. Zool. Soc. Lond., 1888, p. 639, pl. xxxii, fig. 2.

A series, including both sexes, from Yokohama, in Pryer's collection.

Hab. JAPAN.

113. *Drymonia delia.*

Drymonia delia, Leech, Proc. Zool. Soc. Lond., 1888, p. 640, pl. xxxii, fig. 3.

One male specimen from Oiwake in Pryer's collection.

Hab. JAPAN.

114. *Drymonia circumscripta.*

Drymonia circumscripta, Butl., Cist. Ent., iii, p. 125 (1885).

Two specimens from Nikko in Pryer's collection.

Hab. JAPAN.

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115. *Drymonia permagna.*

Drymonia permagna, Butl., Trans. Ent. Soc. Lond., 1881, p. 20.

Three specimens from Yokohama (*Pryer* and *Manley*), I took the species at Hakodate in August.

Hab. JAPAN and YESSO.

Genus BRACHIONYCHA.

Hübn., Verz. Schmett., p. 144 (1822 ?).

116. *Brachionycha atrovittata.*

Asteroscopus atrovittatus, Brem., Bull. Acad. Pétersb., ii, p. 483 (1861); Lep. Ost-Sib., p. 46, pl. v, fig. 4 (1864).

Brachionycha atrovittata, Kirby, Cat. Lep. Het., p. 562 (1892).

One specimen in poor condition in Pryer's collection, probably from Yokohama.

Distribution. JAPAN; AMURLAND.

Genus FENTONIA.

Butl., Trans. Ent. Soc. Lond., 1881, p. 20.

117. *Fentonia ocypete.*

Harpyia ocypete, Brem., Bull. Acad. Pétersb., 1861, p. 481; Lep. Ost-Sib., p. 44, pl. v, fig. 1 (1864).

Fentonia lævis, Butl., Trans. Ent. Soc. Lond., 1881, p. 20; Cist. Ent., iii, p. 129 (1885).

Fentonia ocypete, Hampson, Fauna Brit. Ind., Moths, i, p. 148 (1892); Kirby Cat. Lep. Het., p. 562 (1892).

Uropus ocypete, Oberth., Etud. d'Entom., v, p. 60, pl. viii, fig. 6 (1880).

Uropus (*Urocampa*) *ocypete*, Staud., Rom. sur Lép., vi, p. 343 (1892).

I have specimens from Yokohama and Oiwake.

Distribution. SIMLA (*Hampson*); JAPAN; AMURLAND; NORTH CHINA.

Staudinger (Cat. Lep. Eur., 1871) places *ocypete* in *Uropus*. Butler (Trans. Ent. Soc. Lond., 1881) re-

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described *ocypete* under the name *lævis*, and founded the genus *Fentonia* for its reception; in 1885, however, he admits his *lævis* to be specifically identical with *ocypete*. In 1892 Staudinger (Rom. sur Lép., vi.) proposed *Urocampa* as a generic name for *ocypete*, and as he does not mention *Fentonia lævis*, it is to be presumed that he considered the latter to be a distinct species.

Genus Uropyia.

Staud., Rom. sur Lép., vi, p. 344 (1892).

118. *Uropyia meticulodina.*

Notodonta meticulodina, Oberth., Etud. d'Entom., x, p. 16, pl. i, fig. 3 (1884).
Lophopteryx meticulodina, Kirby, Cat. Lep. Het., p. 606 (1892).
Uropyia meticulodina, Staud., Rom. sur Lép., vi, p. 344, pl. iv, fig. 8, larva (1892).

One specimen from Yesso in Pryer's collection. The type was from Sidemi. Staudinger records the species from Amurland, and describes the larva, which he states feeds upon *Juglans mandschurica*.

Distribution. Sidemi; Amurland; Yesso.

Genus Cnethodonta.

Staud., Rom. sur Lép., iii, p. 215 (1887).

119. *Cnethodonta grisescens.*

Dasychira acronycta, Oberth., Etud. d'Entom., v, p. 35, pl. v, fig. 8, ♀ (1880).
Cnethodonta grisescens, Staud., Rom. sur Lép., iii, p. 214, pl. xii, fig. 11, ♂ (1887).

A male specimen from Oiwake, and a female from Yesso in Pryer's collection.

Distribution. Japan; Yesso; Askold; Amurland.

Genus Stauropus.

Germar, Prod., p. 45 (1811); Hampson, Fauna Brit. Ind., Moths, i, p. 149 (1892).

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120. *Stauropus basalis.*

Stauropus basalis, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 90 (1877).

Harpyia taczanowskii, Oberth., Diagn. Lep. Askold, p. 11 (1879); Etud. d'Entom., v, p. 59, pl. ii, fig. 5 (1880).

There were six specimens from Yokohama in Pryer's collection. I obtained the species at Foochau in April, and at Fushiki in August. Moore's type was from Shanghai. Staudinger records it from Amurland.

Distribution. EASTERN CHINA; ASKOLD; AMURLAND; JAPAN.

121. *Stauropus fagi.*

Bombyx fagi, Linn., Syst. Nat., i, p. 508 (1758); Hübn., Bomb., pl. viii, fig. 31 (1800 ?).

Stauropus fagi, Hampson, Fauna Brit. Ind., Moths., i, p. 149 (1892).

Stauropus persimilis, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 353 (1879).

Some specimens in Pryer's collection from Oiwake and Yokohama.

Distribution. EUROPE.—JAPAN.

122. *Stauropus comatus*, sp. n.

Primaries white, the basal and inner marginal areas are brownish-grey marked with black and there is a brownish-grey patch beyond the cell extending from costa to vein 5. Secondaries white, the abdominal half suffused with blackish and clothed with long silky brown hairs; there is a brownish-grey submarginal band, this is broad from costa to vein 3, thence narrow and indistinct.

Expanse 76 millim.

One female specimen from Omei-shan, taken in June or July.

Hab. WESTERN CHINA.

Genus SOMERA.

Walk., Cat. Lep. Het., iv, p. 882 (1855).

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123. *Somera cyanea.*

Somera cyanea, Leech, Proc. Zool. Soc. Lond., 1888, p. 642, pl. xxxii, fig. 5.

Seven specimens in Pryer's collection from Yokohama and Gifu.

Hab. JAPAN.

Genus CERURA.

Schrank; Hampson, Fauna Brit. Ind., Moths, i, p. 155 (1892).

124. *Cerura furcula.*

Bombyx furcula, Linn., Faun. Suec., p. 298 (1761); Hübn., Bomb., fig. 39 (1800).

Cerura sangaica, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 90 (1877).

I obtained one specimen at Gensan in June.

As the band in *sangaica* is generally narrower than in typical *C. furcula* the name might be retained for this Eastern Asian form of the species.

Distribution. EUROPE.—AMURLAND; COREA; NORTH-EAST CHINA.

125. *Cerura lanigera.*

Cerura lanigera, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 474 (1877); Ill. Typ. Lep. Het., iii, p. 10, pl. xliii, fig. 11 (1879).

Cerura furcula (*part*), Leech., Proc. Zool. Soc. Lond., 1888, p. 644.

There were four specimens from Yokohama in Pryer's collection. These I referred, in error, to *C. furcula* instead of to *C. bifida*, from which species they are hardly separable and of which they may be the Eastern Asian representatives. The central band is not always constricted in the middle as mentioned in the description of *C. lanigera* and in some European examples of *C. bifida* the central band is constricted to the same extent as in typical *C lanigera*.

One of the four examples from Japan is without any trace of the central band.

Staudinger and Pryer state that the larva of *C. lanigera* feeds on both willow and poplar.

Distribution. AMURLAND; COREA; JAPAN.

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Genus DICRANURA.

Boisd., Ind. Méth., p. 54 (1829).

126. *Dicranura vinula.*

Bombyx vinula, Linn., Syst. Nat., i, p. 499 (1758); Hübn., Bomb., pl. ix, fig. 34.
Cerura vinula, Kirby, Cat. Lep. Het., p. 588 (1892).
Dicranura vinula, Hampson, Fauna Brit. Ind., Moths, i, p. 157 (1892).
Dicranura felina, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 474 (1877); Ill. Typ. Lep. Het., ii, p. 12, pl. xxiv, fig. 3 (1878).
Dicranura askolda, Oberth., Etud. d'Entom., v, p. 59, pl. viii, fig. 8 (1880).

There were several specimens in Pryer's collection. I bred a male specimen in June, 1887, from a larva found at Gensan in 1886.

As Pryer points out in his catalogue the larva, which feeds on willow, does not differ at all fromEuropean examples. Graeser makes a similar remark concerning the caterpillar in Amurland.

Felina and *askolda* are not worth retaining even as varietal names as similar forms can be found in any representative series from Europe.

Distribution. EUROPE.—AMURLAND; ASKOLD; JAPAN; COREA.

127. *Dicranura erminea.*

Bombyx erminea, Esp., Schmett., iii, p. 100, pl. xix, figs. 1, 2, (1784); Hübn., Bomb., fig. 35, (1800).
Cerura erminea, Kirby, Cat. Lep. Het., p. 588 (1892).
Cerura menciana, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 89 (1877).

Menciana, Moore, appears to be a good local form of *D. erminea*. The ground colour of the primaries is grey slightly tinged with violet, and the marking are generally better defined than in the type form. I met with this form at Shanghai and Foochau, and I have received specimens from Omei-shan. A native collector in Japan sent me one example, obtained at Hakodate, which agrees with

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the more strongly marked European specimens. Staudinger (Rom. sur Lep., vi, p. 340) records the species from Amurland under the varietal name *candida* and states that this form is whiter than the type and the markings less clearly defined.

Distribution. EUROPE.—AMURLAND; ASKOLD; YESSO; EASTERN and WESTERN CHINA.

Genus PHEOSIA.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 160 (1892).

128. *Pheosia milhauseri.*

Bombyx milhauseri, Fabr., Syst. Ent., p. 577 (1775).
Bombyx terrifica, Hübn., Bomb., pl. viii, figs. 32, 33 (1800).
Hoplitis milhauseri, Kirby, Cat. Lep. Het., p. 595 (1892).
Hybocampa milhauseri, var. *umbrosa*, Staud., Rom. sur Lép., vi, p. 343 (1892).

There were two examples from Ohoyama in Pryer's collection and I received one from Mr. Manley of Yokohama and one from Omei-shan. In all these specimens the ground colour, especially of the secondaries, is darker than in the typical form and they are doubtless referable to var. *umbrosa*, Staud.

Distribution. EUROPE.—AMURLAND; ASKOLD; JAPAN; WESTERN CHINA.

129. *Pheosia pulcherrima.*

Anodonta pulcherrima, Moore, Proc. Zool. Soc. Lond., 1865, p. 814, pl. xliii, fig. 4.
Hupodonta corticalis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 475 (1877); Kirby, Cat. Lep. Het., p. 595 (1892).
Pheosia pulcherrima, Hampson, Fauna Brit. Ind., Moths, i, p. 161 (1892).

Recorded from Yokohama by Butler under the name *corticalis*.

Distribution. SIKHIM; JAPAN

Genus MICROPHALERA.

Butl., Cist. Ent., iii, p. 119 (1885).

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130. *Microphalera grisea.*

Microphalera grisea, Butl., Cist. Ent., iii, p. 120 (1885).

I obtained this species at Hakodate and there were specimens also from Yesso in Pryer's collection.

Hab. YESSO.

131. *Microphalera insignis.*

Destolmia insignis, Butl., Trans. Ent. Soc. Lond., 1881, p. 19.

Microphalera insignis, Kirby, Cat. Lep. Het., p. 594 (1892).

Butler describes this species from Tokio. I did not meet with it and it was not represented in Pryer's collection.

Hab. JAPAN.

Genus NOTODONTA.

Ochs.; Hampson, Fauna Brit. Ind., Moths, i, p. 162 (1892).

132. *Notodonta lineata.*

Notodonta lineata, Oberth., Etud. d'Entom., v, p. 61, pl. ii, fig. 7 (1880).

One specimen in Pryer's collection. The type was from the Isle of Askold.

Distribution. ASKOLD; AMURLAND; JAPAN.

133. *Notodonta monetaria.*

Notodonta monetaria, Oberth., Etud. d'Entom., v, p. 62, pl. ii, fig. 6 (1880).

Stauropus monetaria, Kirby, Cat. Lep. Het., p. 560 (1892).

There were three specimens in Pryer's collection and I took one example at Nagahama in July. Oberthür's type was from the Isle of Askold.

Distribution. ASKOLD; AMURLAND; JAPAN.

134. *Notodonta cinerea.*

Peridea cinerea, Butl., Ann. and Mag. Nat. Hist., (5) iv. p. 353 (1878).

Notodonta cinerea, Kirby, Cat. Lep. Het., p. 600 (1892).

Specimens from Yokohama and Gifu in Pryer's collection I obtained the species at Hakodate in August.

Hab. JAPAN and YESSO.

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135. *Notodonta gigantea.*

Peridea gigantea, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 474 (1877); Ill. Typ. Lep. Het., ii, pl. xxiv, fig. 6 (1878).

Notodonta gigantea, Kirby, Cat. Lep. Het., p. 600 (1892).

A specimen, probably from Yokohama, in Pryer's collection.

Hab. JAPAN.

136. *Notodonta trachitso.*

Notodonta trachitso, Oberth., Etud. d'Entom., xviii, p. 21, pl. iv, fig. 55 (1894).

Type from Tâ-Tsien-Loû, taken in May.

Hab. WESTERN CHINA.

137. *Notodonta toddii.*

Notodonta toddii, Holl., Trans. Amer. Ent. Soc., xxi, p. 73 (1889).

Dr. Holland describes this species from Japan. He states that there was a bad specimen from Yokohama in Pryer's collection, but I have not been able to identify this.

Hab. JAPAN.

Genus LOPHOCOSMA.

Staud., Rom. sur Lép., iii, p. 222 (1887).

138. *Lophocosma atriplaga.*

Notodonta (*Lophocosma*) *atriplaga*, Staud., Rom. sur Lép. iii, p. 220, pl. xii, fig. 8 (1887).

Lophocosma atriplaga, Kirby, Cat. Lep. Het., p. 606, (1892).

A female specimen in Pryer's collection.

Distribution. JAPAN; ASKOLD; AMURLAND.

Genus HYPERÆSCHRA.

Butl., Ann. and Mag. Nat. Hist., (5) vi, p. 65 (1880).

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139. *Hyperæschra tenebrosa.*

Phalera tenebrosa, Moore, Proc. Zool. Soc. Lond., 1865, p. 815.

Hyperæschra tenebrosa, Hampson, Fauna Brit. Ind., Moths, i, p. 164 (1892).

One specimen from Yokohama in Pryer's collection.

Distribution. SIKHIM (*Hampson*); JAPAN.

Genus PTILOPHORA.

Steph., Ill. Brit. Ent., Haust., ii, p. 29 (1828).

140. *Ptilophora plumigera.*

Bombyx plumigera, Esp., Schmett., iii, p. 254, pl. l, figs. 6, 7 (1785).

Ptilophora plumigera, Kirby, Cat. Lep. Het., p. 598 (1892).

One female specimen from Yokohama in Pryer's collection. This is No. 236 of Pryer's catalogue, "Yokohama January," an unusual month for the emergence of this moth.

Distribution. EUROPE.—JAPAN.

Genus LOPHOPTERYX.

Steph., Ill. Brit. Ent., Haust., ii, p. 26 (1829).

141. *Lophopteryx capucina.*

Bombyx capucina, Linn., Syst. Nat., i, p. 507, no. 55 (1758).

Bombyx camelina, Linn., *l.c.*, no. 56; Hübn., Bomb., fig. 19, (1800).

Lophopteryx capucina, Kirby, Cat. Lep. Het., p. 605 (1892).

Lophopteryx camelina, Leech, Proc. Zool. Soc. Lond., 1888, p. 646.

Specimen from Nikko, Fujisan and Oiwake in Pryer's collection. I took examples in June at Hakodate and also met with it at Gensan.

An allied species, *L. saturata*, Walk., is represented in Amurland and the isle of Askold by a form which Graeser (Berl. Ent. Zeitschr., 1888, p. 143) has named *hoegei*.

Distribution. EUROPE.—AMURLAND; JAPAN; YESSO; COREA.

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142. *Lophopteryx umbrosa*, sp. n.

Primaries reddish-brown clouded with darker brown and blackish; there is a pale mark at outer end of discal cell and between this and the outer margin there is a sinuous line which turns obliquely inwards from third median nervule (vein 4) and terminates on inner margin near the lobe. Secondaries fuscous; fringes pale brown marked with fuscous. Under surface: primaries fuscous with some pale brown marks on apical portion of costa and on outer margin; secondaries pale brown with indication of three fuscous bands. Expanse 42 millim.

One male specimen taken at Ni-tou in July.

Hab. WESTERN CHINA.

Allied to *L. ferruginosa*, Moore, from North India.

143. *Lophopteryx pryeri.*

Lophopteryx pryeri, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 355 (1879).

A long series in Pryer's collection, comprising specimens from Yokohama, Oiwake and Yesso.

In some examples all the wings are deeply suffused with fuscous-brown.

Hab. JAPAN and YESSO.

144. *Lophopteryx* (?) *sinensis.*

Lophopteryx sinensis, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 91 (1877).

The type of this species was from Shanghai. There are two specimens from Chekiang in the National Collection. My collectors do not appear to have met with it in any part of China that they visited.

Hab. NORTH-EAST CHINA.

145. *Lophopteryx ladislai.*

Lophopteryx ladislai, Oberth., Etud. d'Entom., v, p. 66, pl. ii, fig. 3 (1880).

There was one male specimen from Nikko in Pryer's collection. Oberthür's type was from the Isle of Askold and the species has been recorded from various places in Amurland.

This species strongly resembles *L. cuculla*, Esp., from Europe.

Distribution. JAPAN; ASKOLD; AMURLAND.

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Genus PLATYCHASMA.

Butl., Trans. Ent. Soc. Lond., 1881, p. 596.

146. *Platychasma virgo.*

Platychasma virgo, Butl., Trans. Ent. Soc. Lond., 1881, p. 596.

I obtained a specimen at Gensan in July; there were three examples from Nikko in Pryer's collection, and I have received one from Mr. Manley of Yokohama.

Distribution. JAPAN; COREA.

Genus PTEROSTOMA.

Germ., Prodr., ii, p. 42 (1812).

Ptilodontis, Steph., Ill. Brit. Ent., Haust., ii, p. 28 (1828).

147. *Pterostoma griseum.*

Ptilodontis grisea, Brem., Lep. Ost. Sib., p. 45, pl. v, fig. 2 (1864).

Pterostoma griseum, Kirby, Cat. Lep. Het., i, p. 597 (1892).

Pterostoma grisea, var. *brunnea*, Graeser, Berl., ent. Zeitschr., 1888, p. 145.

One male specimen from the Wa-ssu-Kow taken in July.

Distribution. AMURLAND; WESTERN CHINA.

148. *Pterostoma sinicum.*

Pterostoma sinica, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 91 (1877).

Pterostoma palpina, Leech, Proc. Zool. Soc. Lond., 1888, p. 638.

Pterostoma palpina, var. *gigantina*, Staud., Rom. sur Lép., vi, p. 363 (1892).

There were specimens in Pryer's collection from Yokohama and Oiwake; I obtained two examples at Nagasaki in June, and my native collector took the species at Hakodate. Specimens have also been received from Ichang, where they were captured in September.

Staudinger records var. *gigantina* as well as typical *P. palpina* from Amurland.

Distribution. JAPAN; YESSO; KIUSHIU; CENTRAL and EASTERN CHINA.

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Genus SPATALIA.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 168 (1892).

149. *Spatalia plusiotis.*

Ptilodontis plusiotis, Oberth., Etud d'Entom., v, p. 65, pl. vii, fig. 3 (1880).

Pterostoma plusiotis, Kirby, Cat. Lep. Het., i, p. 597 (1892).

There were two male specimens from Oiwake and Nikko in Pryer's collection. I have one from Yokohama taken by Mr. Manley and I obtained one female example at Gensan in July.

This species seems to be closely allied to *S. gemmifera*, Moore from Sikhim.

Distribution. ASKOLD; AMURLAND; JAPAN; COREA.

150. *Spatalia macrodonta.*

Rosama macrodonta, Butl., Cist. Ent., iii, p. 127 (1885).

There was a male specimen in Pryer's collection from Japan but the exact locality was not indicated; it was probably Yokohama. Butler's type of the female was from Pekin.

Distribution. JAPAN; NORTH CHINA.

151. *Spatalia ornata.*

Ptilodontis ornata, Oberth., Etud. d'Entom., x, p. 15, pl. ii, fig. 5 (1884).

Two examples from Yokohama in Pryer's collection. The male specimen is smaller than Oberthür's figure which represents an example from Sidemi. *S. ornata* is probably a form of *S. plusioides*, Moore (Lep. Atk., i, p. 62).

Distribution. SIDEMI; JAPAN.

152. *Spatalia cinnamomea.*

Rosama cinnamomea, Leech, Proc. Zool. Soc. Lond., 1888 p. 637, pl. xxxi, fig. 11.

The type was in Pryer's collection and is from Ohoyama. I took a female at Nagasaki in June.

Hab. JAPAN and KIUSHIU.

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Genus GELASTOCERA.

Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 476 (1877).

153. *Gelastocera exusta.*

Gelastocera exusta, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 476 (1877); Ill. Typ. Lep. Het., ii, p. 13, pl. xxiv fig. 2 (1878).

Earias ochroleucana, Staud., Rom. sur Lép., iii, p. 176, pl. viii, fig. 11 (1887); Fixs., *op. cit.*, p. 326.

Specimens from Yokohama and Oiwake in Pryer's collection. I obtained the species at Gensan in June and July. Butler's type was from Hakodate.

The species varies in the tone of the ground colour. The Gensan examples are paler than those from Japan but the pink tinge is stronger than in the specimens from Amurland figured by Staudinger. The markings are identical in all the specimens.

Distribution. JAPAN; YESSO; AMURLAND; COREA.

Genus LEUCODONTA.

Staud., Rom. sur Lép, vi, p. 349 (1892).

154. *Leucodonta bicoloria.*

Bombyx bicoloria, Schiff., Esp., Schmett, iii, pl. xli, fig. 7.
Bombyx bicolora, Hübn., Bomb., pl. v, fig. 18.
Microdonta bicoloria, Kirby, Cat. Lep. Het., p. 603 (1892).
Leucodonta bicoloria, Staud., Rom. sur Lép., vi, p. 349 (1892).

Two specimens in Pryer's collection from Fujisan and the other from Nikko, both taken in June. They are very strongly marked.

Distribution—EUROPE.—AMURLAND; ASKOLD; JAPAN.

Genus ICHTHYURA.

Hübn; Hampson, Fauna Brit. Ind., Moths, i, p. 172 (1892).

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155. *Ichthyura anastomosis.*

Bombyx anastomosis, Linn., Syst. Nat., i, p. 506 (1758).
Clostera anastomosis, var. *orientalis*, Fixsen, Rom. sur Lép., iii, p. 350 (1887).
Ichthyura anastomosis, Hampson, Fauna Brit. Ind., Moths, i, p. 172 (1892).
Melalopha anastomosis, Kirby, Cat. Lep. Het., p. 609 (1892).

There were five specimens from Yesso in Pryer's collection and I have received four examples from Pu-tsu-fong, taken in June or July.

The specimens from China as well as those from Yesso agree with European examples.

Distribution. EUROPE.—AMURLAND; COREA; YESSO; WESTERN CHINA.

156. *Ichthyura anachoreta.*

Bombyx anachoreta, Fabr., Mant. Ins., ii, p. 120 (1787); Hübn., Bomb., pl. xxii, fig. 88 (1880).
Ichthyura fulgurita, Walk., Cat. Lep. Het., xxxii, p. 433 (1865).
Melalopha fulgurita, Kirby, Cat. Lep. Het., p. 611 (1892).
Ichthyura anachoreta, Hampson, Fauna Brit. Ind., Moths, i, p. 172 (1892).

A nice series from Yokohama in Pryer's collection. I obtained one example at Hakodate in August and have received specimens from Ichang, Chang-yang, and Pu-tsu-fong, taken in July.

I do not find that the Asiatic specimens of this species differ in any way from the European.

Distribution. EUROPE.—AMURLAND; JAPAN; YESSO; CENTRAL and WESTERN CHINA; and according to Hampson, throughout INDIA and CEYLON; JAVA.

Genus PLUSIOGRAMMA.

Hampson, Trans. Ent. Soc. Lond., 1895, p. 278.

157. *Plusiogramma aurosigna.*

Plusiogramma aurosigna, Hampson, Trans. Ent. Soc. Lond., 1895, p. 278 (fig.)

One male specimen taken at Chang-yang in August.

Distribution. TENASSERIM; CENTRAL CHINA.

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Genus PYGÆRA.

Ochs., Schmett. Eur., iii, p. 224 (1810).

158. *Pygæra timonides.*

Pygæra timonides, Brem., Lep. Ost-Sib., p. 45 (1864).
Pygæra timoniorum, Brem., *l.c.*, pl. v, fig. 3.
Clostera timonides, Oberth., Etud. d'Entom., x, p. 13, pl. ii, fig. 2 (1884).
Gonoclostera latipennis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 476 (1877); Ill. Typ. Lep. Het., ii, p. 13, pl. xxvii, fig. 2 (1878).

I captured this species at Hakodate in August; there were eight specimens from Yokohama and Nikko in Pryer's collection. Staudinger records one example from a locality to the north of Pekin (Rom. sur Lép., vi, p. 370).

Distribution. AMURLAND; JAPAN; YESSO; NORTH CHINA.

Genus NERICE.

Walk., Cat. Lep. Het., v, p. 1076 (1855).

159. *Nerice davidi.*

Nerice davidi, Oberth., Etud. d'Entom., vi, p. 17, pl. ix, fig. 2 (1881).
Nerice bidentata, Leech, Proc. Zool. Soc., 1888, p. 638.

I obtained two specimens at Hakodate in August. Oberthür's type was from the north of China but the exact locality is not mentioned.

Distribution. JAPAN; NORTH CHINA.

160. *Nerice bipartita.*

Nerice bipartita, Butl., Cist., Ent., iii, p. 119 (1885).
Nerice upina, Alph., Rom. sur Lép., vi, p. 17, pl. 1, fig. 7 (1892).

Butler records this species from Sappora, Nikko and Yesso. There was one example from each of the last named localities in Pryer's collection. Alphéraky records the species under the name *N. upina* from Ou-pin.

Distribution. JAPAN; YESSO; NORTH CHINA.

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Family SYNTOMIDÆ.

Genus SYNTOMIS.

Ochs.; Hampson, Fauna Brit. Ind., Moths, i, p. 212 (1892).

161. *Syntomis erebina.*

Syntomis erebina, Butl., Trans. Ent. Soc. Lond., 1881, p. 5.
Zygæna erebina, Kirby, Cat. Lep. Het., i, p. 90 (1892).

Butler describes this species from Tokio and states that it is allied to the European *S. phegea*. There is an aberrant example in the series at South Kensington Natural History Museum which has the primaries almost entirely black and with but little indications of hyaline markings.

Hab. JAPAN.

162. *Syntomis fortunei.*

Syntomis fortunei, De l'Orza, Lép. Jap., p. 38 (1869).
Zygæna fortunei, Kirby, Cat. Lep. Het., i, p. 92 (1892).

Several specimens from Yokohama in Pryer's collection. I obtained this species at Tsuruga, Nagahama, Shimonoseki, Hakone and Gensan in June and July and my native collector took it at Nikko and Hakodate. One specimen only was received from Chang-yang.

Distribution. JAPAN; YESSO; COREA; CENTRAL CHINA.

163. *Syntomis cingulata.*

Zygæna cingulata, Web., Obs. Ent., p. 109 (1801).
Syntomis annetta, Butl., Journ. Linn. Soc. Lond., Zool., xii, p. 347 (1876): Ill. Typ. Lep. Het., ii, p. 4, pl. xlii, fig. 1 (1878).
Syntomis atereus, Walk., Cat. Lep. Het., i, p. 128 (1854).
Syntomis fortunei (*part*) Leech, Proc. Zool. Soc. Lond., 1888, p. 593.

Recorded from China but the exact locality is not indicated by either author.

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164. *Syntomis thelebus.*

Zygæna thelebus, Fabr., Mant. Ins., ii, p. 103 (1787); Kirby, Cat. Lep. Het., i, p. 95 (1892).
Syntomis thelebus, Mén., Schrenck's Reisen, Lep., p. 48 (1859); Leech, Proc. Zool. Soc. Lond., 1888, p. 593.
Syntomis germana, Feld., Wien. ent. Mon., vi, p. 37 (1862).
Syntomis mandarinia, Butl., Journ. Linn. Soc. Lond., Zool., xii, p. 349 (1876).

I have an extensive series of this species which comprises specimens from Nagahama, Nagasaki, Tsuruga, Oiwake, Ningpo, Kiukiang, Chang-yang, Foochau, Gensan, Chia-ting-fu, Huang-mu-chang, and the province of Kwei-chow. Pryer gives Ohoyama, Fujisan, and Kanosan as other Japanese localities.

The Ningpo specimens agree with *germana* which, as Felder states, differs from *thelebus* in being smaller in size and in having narrower yellow bands on the abdomen.

Distribution. JAPAN; KIUSHIU; CENTRAL and WESTERN CHINA; COREA; AMURLAND.

165. *Syntomis formosæ.*

Syntomis formosæ, Butl., Journ. Linn. Soc. Lond., Zool., xii, p. 346 (1876).
Zygæna formosæ, Kirby, Cat. Lep. Het., i, p. 92 (1892).
Syntomis emma, Butl., *l.c.*, p. 350.

These two insects appear to be forms of a species allied to *S. thelebus*. They were described from Formosa and Foochow.

Hab. EASTERN and NORTH CHINA.

166. *Syntomis pascus.*

Syntomis pascus, Leech, Trans. Ent. Soc. Lond., 1889, p. 124, pl. ix, fig. 1.
Zygæna pascus, Kirby, Cat. Lep. Het., i, p. 94 (1892).

Originally described from Kiukiang. I have since received a number of specimens from Moupin and single examples from Chia-ting-fu and the province of Kwei-chow. Occurs in June and July.

There is some variation in the size of the hyaline spots and in some examples there are two subapical spots. The only specimen I have seen from Kwei-chow has this

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additional spot and the black borders of all the wings are much narrower than in any other specimen in the series.

In the original description of this species it is stated that the male has six belts on the abdomen and the female five; but as there is also a band on the first segment of the abdomen it would perhaps be better to amend the description by saying that the male has seven and the female six yellow bands.

Hab. CENTRAL and WESTERN CHINA.

167. *Syntomis euryzona.*

Syntomis euryzona, Leech, Entom., xxxi, p. 153 (1898).

One male specimen from Moupin, June.

Hab. WESTERN CHINA.

168. *Syntomis torquatus.*

Syntomis torquatus, Leech, Trans. Ent. Soc. Lond., 1889, p. 124, pl. ix, fig. 2.

Zygæna torquatus, Kirby, Cat. Lep. Het., i, p. 92 (1892).

Described from a Kiukiang specimen. I have also examples from Chia-kou-ho and Kwei-chow, taken in July, and one from Ichang, taken in August.

Hab. CENTRAL and WESTERN CHINA.

169. *Syntomis xanthoma.*

Syntomis xanthoma, Leech, Entom., xxxi, p. 152 (1898).

Described from four male specimens taken in June or July in the province of Kwei-chow.

Hab. WESTERN CHINA.

170. *Syntomis perixanthia.*

Syntomis perixanthia, Hampson, Cat. Lep. Phal., i, *ined.* (1898).

Occurs at Omei-shan, Moupin, Kwei-chow, Wa-shan, in June. I have a long series, but most of the specimens are from Moupin. The type, which is in the National Collection at South Kensington, is from Formosa.

The hyaline markings vary in size, but appear to be constant in number. In some examples, chiefly females, there is a small yellow spot (not hyaline), seeming to be a detached portion of the pair of spots below the cell.

The males range from 40—48 millim. in expanse, and the females from 45—50 millim.

Distribution. WESTERN CHINA; FORMOSA.

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171. *Syntomis persimilis.*

Syntomis persimilis, Leech, Entom., xxxi, p. 152 (1898).

Three female specimens from Ni-tou and Omei-shan.

Similar to *S. perixanthia* but smaller, and the collar is black instead of yellow.

Hab. WESTERN CHINA.

172. *Syntomis acrospila.*

Syntomis acrospila, Feld., Reise Nov., Lep., iv, pl. cii, fig. 11 (1875).

Zygæna acrospila, Kirby, Cat. Lep. Het., i, p. 94 (1892).

My collectors appear to have met with this species commonly at Wa-shan in July; they also obtained specimens in the same month at Ta-chien-lu, Huang-mu-chang, Ni-tou, and Chia-kou-ho.

In the Huang-mu-chang example, the hyaline spots in the interno-median interspace are united. I propose the varietal name *confluens* for this form.

Distribution. WESTERN and NORTH-EASTERN CHINA.

173. *Syntomis muirheadi.*

Syntomis muirheadi, Feld., Wien. ent. Mon., vi, p. 37 (1862).

Zygæna muirheadi, Kirby, Cat. Lep. Het., i, p. 95 (1892).

Occurs fairly commonly at Kiukiang in June; I have also received specimens taken in the same month in the province of Kwei-chow and at Ningpo, and others captured in July at Chia-ting-fu.

The Kwei-chow specimens have much larger hyaline spots than the other examples comprised in the series.

Distribution. CENTRAL, WESTERN and NORTH-EASTERN CHINA.

174. *Syntomis swinhoei.*

Syntomis swinhoei, Leech, Entom., xxxi, p. 152 (1898).
Syntomis swinhoei, var. *obsoleta*, Leech, *l. c.*

Occurs in June and July at Moupin, Chia-ting-fu, and Ningpo.

Distribution. NORTH-EASTERN and WESTERN CHINA.

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175. *Syntomis dichotoma.*

Syntomis dichotoma, Leech, Entom., xxxi, p. 153 (1898).
Syntomis dichotoma, var. *concurrens*, Leech, *l. c.*

The type form appears to be common at Moupin in June, but the variety has only been received from Kia-ting-fu and the province of Kwei-chow.

Hab. WESTERN CHINA.

176. *Syntomis davidi.*

Syntomis davidi, Pouj., Bull. Soc. Ent. Fr., (6) iv, p. cxxxvii (1885).
Zygæna davidi, Kirby, Cat. Lep. Het., i, p. 96 (1892).

I have examples of this species from Chang-yang, Chia-kou-ho, and Wa-shan, taken in June and July; also three specimens from Huang-mu-chang, captured in August.

Hab. CENTRAL and WESTERN CHINA.

177. *Syntomis aucta.*

Syntomis aucta, Leech, Entom., xxxi, p. 153 (1898).

Three specimens from the province of Kwei-chow, taken in June or July.

Hab. WESTERN CHINA.

178. *Syntomis blanchardi.*

Syntomis blanchardi, Pouj., Bull. Soc. Ent. Fr., (6) iv, p. cxxxvi (1885); Hampson, Fauna Brit. Ind., Moths, i, p. 221 (1892).
Zygæna blanchardi, Kirby, Cat. Lep. Het., i, p. 92 (1892).

Described by Poujade from Moupin. I have specimens from that locality and also from Chow-pin-sa, Wa-shan, Omei-shan, and Pu-tsu-fong, taken in June and July.

The specimens exhibit a good deal of variation in the width of the black on outer margin of the primaries; in some examples the black is projected inwards along the fifth vein, and in others there is a similar projection along the second vein also; the black border of the secondaries also varies in width, and the colour of the collar, tegulæ, and abdomen ranges from yellow to dull

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crimson. The hyaline portions of the wings may or may not be yellowish, but this seems to be largely a matter of condition.

I am inclined to think that *blanchardi* is probably not specifically distinct from *S. multigutta*.

Distribution. SIKHIM (*Hampson*); WESTERN CHINA.

179. *Syntomis multigutta.*

Syntomis multigutta, Walk., Cat. Lep. Het., i, p. 134 (1854); Hampson, Fauna Brit. Ind., Moths, i, p. 220 (1892).

Hydrusa multigutta, Butl., Ill. Typ. Lep. Het., i, p. 19, pl. vii, fig. 3 (1877); Kirby, Cat. Lep. Het., i, p. 102 (1892).

Four specimens from Ni-tou, taken in July.

The black on the apex of the primaries is broader than in the type. In one example the collar, tegulæ, and ground colour of the abdomen are tinged with crimson.

Distribution. NEPAL; SIKHIM; TIBET; BURMA (*Hampson*); WESTERN CHINA.

180. *Syntomis rubrozonata.*

Syntomis rubrozonata, Pouj., Bull. Soc. Ent. Fr., (6) vi, p. cxvii (1886).

Zygæna rubrizonata, Kirby, Cat. Lep. Het., i, p. 93 (1892).

A male specimen from Moupin and a female from Omei-shan, taken in June. Poujade records three males and one female from Moupin.

Hab. WESTERN CHINA.

181. *Syntomis consequa.*

Syntomis consequa, Leech, Entom., xxxi, p. 153 (1898).

One female specimen from Moupin: June.

Allied to *S. rubrozonata*.

Hab. WESTERN CHINA.

182. *Syntomis leucoma.*

Syntomis leucoma, Leech, Entom., xxxi, p. 154 (1898).

One male specimen from Omei-shan: June.

Hab. WESTERN CHINA.

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183. *Syntomis pratti.*

Syntomis pratti, Leech, Trans. Ent. Soc. Lond., 1889, p. 123, pl. ix, fig. 3.
Zygæna pratti, Kirby, Cat. Lep. Het., i, p. 95 (1892).

One example of each sex from Kiukiang.
Hab. CENTRAL CHINA.

Family ZYGÆNIDÆ.

Subfamily *ZYGÆNINÆ.*

Genus ZYGÆNA.

Fabr., Syst. Ent., p. 550 (1775).

184. *Zygæna niphona.*

Zygæna niphona, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 393 (1877); Ill. Typ. Lep. Het., ii, p. 9, pl. xxi, fig. 9 (1878); Leech, Proc. Zool. Soc. Lond., 1888, p. 597.
Anthrocera niphona, Kirby, Cat. Lep. Het., i, p. 73 (1892).
Zygæna christophi, Staud., Rom. sur Lép., iii, p. 173, pl. viii, fig. 9 (1887).

Butler's type was from Yokohama; there was a fine series from Oiwake in Pryer's collection, and my native collector met with the species at Hakodate in August. Staudinger described it from Amurland as *christophi*.

There may be either five or six spots on the upper surface of the primaries; but the sixth spot is always indicated on the under surface, sometimes only faintly. Butler's figure represents a specimen with the spots confluent, and I have two similar specimens in my series; but such variation does not appear to be of frequent occurrence.

Distribution. AMURLAND; JAPAN; YESSO.

Genus AGLAOPE.

Latreille, Gen. Crust. Ins., iv, p. 214 (1809).

185. *Aglaope fasciata.*

Aglaope fasciata, Feld., Wien. ent. Mon., vi, p. 32 (1862).

This species, which is near *Aglaope infausta*, was described by Felder from Ningpo. My collectors did not meet with it in any part of China that they visited.

Hab. CHINA.

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Genus BINTHA.

Bintha, Walk., Cat. Lep. Het., xxxi, p. 127 (1864).

Artona (*part*), Hampson, Fauna Brit. Ind., Moths, i, p. 234 (1892).

186. *Bintha gracilis.*

Bintha gracilis, Walk., Cat. Lep. Het., xxxi, p. 127 (1864); Butl., Ill. Typ. Lep. Het., iii, p. 5, pl. xliii, fig. 3 (1879).

Six specimens from Yokohama in Pryer's collection; I obtained the species at Nagahama and Gensan in July.

Distribution. JAPAN; COREA.

187. *Bintha octomaculata.*

Euchromia octomaculata, Brem., Bull. Acad. Petr., iii, p. 476 (1861); Lep. Ost-Sib., p. 36, pl. iv, fig. 1 (1864).

Bintha octomaculata, Kirby, Cat. Lep. Het., i, p. 110 (1892).

Rhaphidognatha sesiæformis, Feld., Wien. ent. Mon., vi, p. 32 (1862); Reise Nov., Lep., iv, pl. lxxxiii, fig. 1 (1874).

Balatæa ægerioides, Walk., Cat. Lep. Het., xxxi, p. iii (1864); Butl., Ill. Typ. Lep. Het., iii, p. 4, pl. xlii, fig. 2 (1879).

Balatæa sesiæformis, Kirby, Cat. Lep. Het., i, p. 109 (1892).

Balatæa octomaculata, Leech, Proc. Zool. Soc. Lond., 1888, p. 594.

One female specimen from Ohoyama in Pryer's collection; I took four males at Gensan in June and I have received examples from Chang-yang and Ichang.

B. ægerioides, Walk., is not separable from *octomaculata*, Brem., and the former is certainly identical with *sesiæformis*, Feld.

Distribution. AMURLAND; JAPAN; COREA; CENTRAL and NORTH CHINA.

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188. *Bintha (?) clathrata.*

Bintha clathrata, Pouj., Bull. Soc. Ent. Fr., (6) vi, p. cxvii (1886).

Poujade describes this species from a female specimen received from Moupin.

Hab. WESTERN CHINA.

Genus CHRYSARTONA.

Swinhoe, Cat. Lep. Het. Mus. Oxford, p. 56; Hampson, Fauna Brit. Ind., Moths, i, p. 232 (1892).

189. *Chrysartona stipata.*

Procris stipata, Walk., Cat. Lep. Het., i, p. 114 (1854); Butl., Ill. Typ. Lep. Het., i, p. 13, pl. vii, fig. 9 (1877).

Chrysartona stipata, Hampson, Fauna Brit. Ind., Moths, i, p. 232 (1892); Alph., Rom. sur Lép., ix, p. 121 (1897).

Alphéraky records a female specimen from Tâ-chouivan, in the province Sé-Tchouen.

Distribution. KANGRA; SIKHIM; BURMA; BERNARDMYO (*Hampson*); WESTERN CHINA.

Genus BREMERIA.

Alphéraky, Rom. sur Lép., vi, p. 7 (1892).

190. *Bremeria manza.*

Bremeria manza, Alph., Rom. sur Lép., vi, p. 7, pl. i, fig. 3 (1892); *op. cit.*, ix, p. 122 (1897).

Alphéraky describes this species from a female specimen taken in July near the Heï-hò river in the province of Gan-sou.

Hab. NORTH-WESTERN CHINA.

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191. *Bremeria sinica.*

Bremeria sinica, Alph., Rom. sur Lép., ix, p. 122, pl. xii, fig. 6 (1897).

Alphéraky describes a specimen from Sé-Tchouen which he considers to be a female, but is not certain of the sex as the body was damaged. If this should prove to be a male, he suggests that the species should be removed to the genus *Chrysartona*.

Hab. WESTERN CHINA.

Genus ARTONA.

Walk., Cat. Lep. Het., ii, p. 439 (1854).
Artona (*part*), Hampson, Fauna Brit. Ind., Moths, i, p. 234 (1892).

192. *Artona sieversi.*

Artona sieversi, Alph., Rom. sur Lép., vi, p. 5, pl. i, fig. 4 (1892).
Artona dejeani, Oberth., Etud. d'Entom., xix, p. 29, pl. vi, fig. 51 (1894).

My collectors met with this species throughout their journey in Western China during the months of June and July.

Hab. NORTHERN and WESTERN CHINA.

193. *Artona cuneonotata*, sp. n.

Frons white; abdomen blackish above whitish below, legs whitish.

Primaries brownish-black; there is a narrow streak above the cell, a wedge-shaped streak below the cell and a quadrate spot at the outer end of the cell, all pale yellow. Secondaries pale yellow intersected by the black vein 1*c* and broadly bordered with black. Fringes of all the wings pale yellow. Expanse 20 millim.

One male specimen from Wa-shan and one from Pu-tsu-fong, both taken in July.

Hab. WESTERN CHINA.

Allied to *A. sieversi* but distinguished by the subcostal streak and smaller spot at the end of the cell on the primaries and by the broader borders of the secondaries.

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194. *Artona delavayi.*

Artona delavayi, Oberth., Etud. d'Entom., xix, p. 29, pl. v, fig. 39 (1894).

A fine series comprising specimens from How-Kow, Ta-chien-lu, Moupin, and Chia-Kou-ho ; the species occurs in the month of July. Oberthür's types, two males, were from Yunnan.

Distribution. WESTERN CHINA; YUNNAN.

195. *Artona cyanicornis.*

Bintha cyanicornis, Pouj., Bull. Soc. Ent. Fr., (6) vi, p. cxvi (1886).

Poujade describes this species from Moupin. I received a male specimen from Chang-yang and a female from Omei-shan, both taken in June.

Hab. CENTRAL and WESTERN CHINA.

196. *Artona aurulenta.*

Bintha aurulenta, Pouj., Bull. Soc. Ent. Fr., (6) vi, p. cxvi (1886).

Poujade describes this species from one male specimen and five females received from Moupin.

Hab. WESTERN CHINA.

197. *Artona albomacula*, sp. n.

Primaries black with three white spots placed as in *A. aurulenta*, Pouj., *i.e.*, one in the cell, one below cell and a slightly angulated lunule beyond. Secondaries white with broad black borders. Fringes white marked with blackish.

Expanse 20 millim.

One male specimen from Chow-pin-sa taken in May or June.

Hab. WESTERN CHINA.

This may possibly be a colour-aberration of *A. aurulenta*.

198. *Artona superba.*

Antona superba, Alph., Rom. sur Lép., ix, p. 121, pl. xii, fig. 5, ♀ (1897).

Alphéraky describes a female specimen taken on August 27th in the Siaô-tjin-hô valley in the province of Sé-Tchouen (Szechuen).

Hab. WESTERN CHINA.

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Genus TASEMA.

Walk.; Hampson, Fauna Brit. Ind., Moths, i, p. 236 (1892).

199. *Tasema mærens.*

Aglaino mærens, Staud., Rom. sur Lép., iii, p. 171 (1887).

Three specimens from Yokohama in Pryer's collection.

Distribution. NORTHERN CHINA; AMURLAND; JAPAN.

This species seems very closely allied to *T. bipars*, Walk., and possibly may be specifically identical with it.

Genus THYRASSIA.

Butl., Journ. Linn. Soc., Zool., xii, p. 355 (1876).

200. *Thyrassia penangæ.*

Syntomis penangæ, Moore, Proc. Zool. Soc. Lond., 1859, p. 198, pl. lx, fig. 7.
Hydrusa penangæ, Kirby, Cat. Lep. Het., i, p. 102 (1892); Swinhoe, Cat. Lep. Het. Oxford, p. 51 (1892).

Moore described this species from Penang. I have a specimen from the province of Kwei-chow taken in June or July.

Distribution. PENANG; WESTERN CHINA.

Swinhoe gives *Syntomis diversa*, Walk. (C.L.H., xxxi, p. 75) as a synonym of *Hydrusa penangæ*, Moore.

Genus CLELEA.

Walk., Cat. Lep. Het., ii, p. 465 (1854).

201. *Clelea sapphirina.*

Clelea sapphirina, Walk., Cat. Lep. Het., ii, p. 465 (1853); Hampson, Fauna Brit. Ind., Moths, i, p. 239 (1892).

Occurs at Chang-yang, Ichang and Omei-shan in June and July. Walker's type is from Hong-Kong

Distribution. SIKHIM; MOMEIT; BURMA (*Hampson*); CENTRAL, WESTERN and SOUTHERN CHINA.

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202. *Clelea syfanica.*

Laurion syfanicum, Oberth., Etud. d'Entom., xix, p. 25, pl. vi, fig. 45 (1894).

One example of each sex received from Moupin, where they were captured in June. Oberthür's specimens (two males) were from the "Vallée du Tong-Hó" and were taken in April and May.

The female has very long simple antennæ.

Hab. WESTERN CHINA.

Genus ADSCITA.

Retz.; Kirby, Cat. Lep. Het., i, p. 81 (1892).

203. *Adscita tristis.*

Procris tristis, Brem., Lep. Ost-Sib., p. 97, pl. viii, fig. 4 (1864); Leech, Proc. Zool. Soc. Lond., 1888, p. 594.
Adscita tristis, Kirby, Cat. Lep. Het., i, p. 82 (1892).
Procris esmeralda, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 394 (1877); Ill. Typ. Lep. Het., ii, p. 4, pl. xxi, fig. 8 (1878).

Common in Japan and Corea. I have one example of the type form from Chang-yang taken in June.

Of forty specimens from Japan and Corea eight are of various shades of green (var. *esmeralda*) and seventeen more or less blackish-grey; the remainder are not quite like either typical *tristis* or *esmeralda*.

The insect recorded by Motschulsky, as *Procris budensis*, from Japan should probably be referred to this species.

Distribution. AMURLAND; EAST SIBERIA; JAPAN; COREA; CENTRAL CHINA.

204. *Adscita funeralis.*

Procris funeralis, Butl., Ann. and Mag. Nat. Hist., (5) iv. p. 351 (1879).
Adscita funeralis, Kirby, Cat. Lep. Het., i, p. 82 (1892).

One male specimen taken at Chang-yang in June, and one example of the same sex taken at Gensan in July. Butler's type was from Japan.

Distribution. JAPAN; COREA; CENTRAL CHINA.

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205. *Adscita fusca.*

Procris fusca, Leech, Proc. Zool. Soc. Lond., 1888, p. 595, pl. xxx, figs. 6, 6*a*.
Adscita fusca, Kirby, Cat. Lep. Het., i, p. 82 (1892).

Four specimens from Oiwake in Pryer's collection and one example from Ichang, the latter taken in June.
Distribution. JAPAN; CENTRAL CHINA.

206. *Pseudopsyche ? yarka.*

Pseudopsyche ? yarka, Oberth., Etud. d'Entom., xviii, p. 42, pl. iv, fig. 49 (1894).

Oberthür describes this species from Ta-chien-lu.
Hab. WESTERN CHINA.

Genus ARÆOCERA.

Hampson, Fauna Brit. Ind., Moths, i, p. 244 (1892).

207. *Aræocera chinensis.*

Ino chinensis, Feld., Wien. ent. Mon., vi, p. 31 (1862).
Adscita chinensis, Kirby, Cat. Lep. Het., i, p. 82 (1892).

I obtained specimens at Nagasaki in June; there were two specimens in Pryer's collection from Yokohama.
Distribution. NORTH CHINA; JAPAN; KIUSHIU.

Genus AMURIA.

Staud., Rom. sur Lép., iii, p. 172 (1887).

208. *Amuria cyclops.*

Amuria cyclops, Staud., Rom. sur Lép., iii, p. 172, pl. viii, fig. 6 (1887).

One male specimen from Chang-yang, taken in June.
Distribution. AMURLAND; CENTRAL CHINA.

Genus ILLIBERIS.

Walk., Cat. Lep. Het., ii, p. 280 (1854).

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209. *Illiberis nigrigemma.*

Glaucopis nigrigemma, Walk., Cat. Lep. Het., i, p. 141 (1854).
Zama cyanecula, Herr.-Schäff., Auss. Schmett., i, p. 7, fig. 224 (1855).
Northia cyanecula, Butl., Ill. Typ. Lep. Het., i, p. 13, pl. vii, fig. 8 (1877).
Illiberis nigrigemma, Kirby, Cat. Lep. Het., i, p. 88 (1892).
Illiberis cyanecula, Swinhoe, Cat. Lep. Het. Oxford, p. 59 (1892).

This species has been recorded from Hong-Kong and North China. My collectors did not meet with it.
Distribution. NORTH and SOUTH CHINA.

210. *Illiberis translucida.*

Procris translucida, Pouj., Bull. Soc. Ent. Fr., (6) iv, p. cxxxvi (1885).
Adscita translucida, Kirby, Cat. Lep. Het., i, p. 82 (1892).
Northia translucida, Oberth., Etud. d'Entom., xix, pl. vi, fig. 66 (1894).

I have four specimens from Moupin and one from Wa-Sen-Kow, all taken in June.
Hab. WESTERN CHINA.

211. *Illiberis tenuis.*

Northia tenuis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 394 (1877); Ill. Typ. Lep. Het., ii, p. 9, pl. xxi, fig. 7 (1878).
Illiberis tenuis, Kirby, Cat. Lep. Het., i, p. 88 (1892).

I obtained this species in Satsuma and at Nagasaki in May and at Hakodate in August; there were specimens from Oiwake, Yokohama and Yesso in Pryer's collection. Two specimens have been received from Moupin where they were taken in June.
Distribution. AMURLAND; COREA; JAPAN; YESSO; KIUSHIU; WESTERN CHINA.
Perhaps identical with *I. khasiana*, Moore, which species Hampson refers to his Section III of the genus *Phacusa*, Walker.

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212. *Illiberis consimilis*, sp. n.

Closely allied to *I. tenuis*, but the primaries are fuscous grey and the secondaries are slightly tinged with the same colour. The borders of all the wings are very narrow and the costal area of secondaries is not blackish.

Expanse 30 millim.

Two female specimens in Pryer's collection but without exact locality.

Hab. JAPAN.

213. *Illiberis dirce.*

Northia dirce, Leech, Proc. Zool. Soc. Lond., 1888, p. 596, pl. xxx, fig. 8.

Illiberis dirce, Kirby, Cat. Lep. Het., i, p. 88 (1892).

A female example from Gensan taken in June. There are four specimens from North China in the National Museum at South Kensington.

Distribution. COREA; NORTH CHINA.

214. *Illiberis cybele.*

Northia cybele, Leech, Proc. Zool. Soc. Lond., 1888, p. 596, pl. xxx, fig. 9.

Illiberis cybele, Kirby, Cat. Lep. Het., i, p. 88 (1892).

I took the type (♀) at Gensan in June.

Hab. COREA.

215. *Illiberis sinensis.*

Illiberis sinensis, Walk., Cat. Lep. Het., ii, p. 280 (1854).

Northia sinensis, Leech, Proc. Zool. Soc. Lond., 1888, p. 595, pl. xxx, fig. 20.

I took specimens at Foochau in April and at Gensan in June and have received examples from Ichang, Changyang, Kiukiang, and Mopuin.

Distribution. AMURLAND; COREA; JAPAN; YESSO; NORTHERN, CENTRAL and WESTERN CHINA.

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216. *Illiberis psychina.*

Procris psychina, Oberth., Etud. d'Entom., v, p. 28, pl. vii, fig. 6 (1880).
Northia psychina, Leech, Proc. Zool. Soc. Lond., 1888, p. 596.
Illiberis sinensis, Kirby, Cat. Lep. Het., i, p. 88 (1892).

I obtained one example at Hakodate in August and there were two specimens in Pryer's collection.

Distribution. ASKOLD; JAPAN; YESSO.

217. *Illiberis ochracea*, sp. n.

Greatly resembling *I. elegans*, Pouj., but with the abdomen dingy-ochreous above and brighter below.

Expanse ♂ 20—26 millim ♀ 30 millim.

Five male specimens and one female from the province of Kwei-chow, one male from Moupin and another from Ichang; all taken in June.

I have one specimen, which I took in Foochau in April, that seems to be referable to this species, but the primaries are rather opaque.

Hab. CENTRAL and WESTERN CHINA.

218. *Illiberis elegans.*

Thyrina elegans, Pouj., Ann. Soc. Ent. Fr., 1886, p. cxliii.

Type from Moupin. I have several specimens from Moupin and two from the province of Kwei-chow.

This species is very closely allied to *I. psychina.*

Hab. WESTERN CHINA.

219. *Illiberis nigra.*

Procris nigra, Leech, Proc. Zool. Soc. Lond., 1888, p. 595, pl. xxx, figs. 7, 7*a*.
Adscita nigra, Kirby, Cat. Lep. Het., i, p. 83 (1892).

One female specimen from Ohoyama in Pryer's collection.

Hab. JAPAN.

Genus PHACUSA.

Walk., Cat. Lep. Het., i, p. 150 (1854).

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220. *Phacusa djreuma.*

Phacusa djreuma, Oberth., Etud. d'Entom., xviii, p. 21, pl. ii, fig. 31 (1893).

Described by Oberthür from Tsé-kou.
Hab. WESTERN CHINA.

Genus PIAROSOMA.

Hampson, Fauna Brit. Ind., Moths, i, p. 243 (1892).

221. *Piarosoma hyalina.*

Arachotia hyalina, Leech, Trans. Ent. Soc. Lond., 1889, p. 123, pl. vii, fig. 6.
Phacusa thibetana, Oberth., Etud. d'Entom., xix, p. 30, pl. v, fig. 23 (1894).

One male specimen from Kiukiang taken in June.
I described this species from Kiukiang and Oberthür redescribed it from Ta-chien-lu and Moupin.
Hab. CENTRAL and WESTERN CHINA.

Subfamily *CHALCOSIINÆ.*

Genus SORITIA.

Walk., Cat. Lep. Hep., ii, p. 435 (1854).

222. *Soritia leptalina.*

Chalcosia leptalina, Koll., Hügel's Kasch., iv (2), p. 462 (1844).
Eterusia sexpunctata, Walk., Cat. Lep. Het., ii, p. 432 (1854).
Heterusia octopunctata, Motsch., Stett. Ent. Zeit., 1872, p. 344.
Soritia leptalina, Hampson, Fauna Brit. Ind., Moths, i, p. 252 (1892).

Two male specimens and eight females from Kwei-chow; one female from Moupin and four examples of the same sex from Chang-yang. June and July.
The males have a yellow triangular patch extending from the base to beyond the middle of the primaries. The females are variable as regards number of spots; two of

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the Chang-yang specimens are referable to *octopunctata* and two to *sexpunctata*. All but two of the Kwei-chow examples are six spotted, one of the exceptions has four spots and the other two only, *i.e.*, one on each primary. The Moupin female has pale straw-coloured secondaries with two very faint spots on each of the wings, and two well developed spots on each primary. One female from Kwei-chow has two spots on the left primary and one on the left secondary, whilst on the opposite pair the primary only is marked with one dot.

Distribution. HIMALAYAS; SYLHET; BURMA; BERNARDMYO (*Hampson*); CENTRAL and WESTERN CHINA.

223. *Soritia elizabetha.*

Eterusia elizabetha, Walk., Cat. Lep. Het., ii, p. 433 (1854).

Heterusia microcephala, Feld., Reise Nov., Lep., iv, pl. lxxxiii, fig. 7 (1874).

It occurs at Chang-yang, Ichang, Kiukiang, and Ta-chien-lu; June, July, and August. I have only two female specimens, both from Ichang taken in August. The only example that I have from Ta-chien-lu is a male taken in July; it is not in very good condition but the yellow is deeper in tone than in any of the other specimens.

Distribution. CENTRAL, WESTERN, and NORTH-EASTERN CHINA.

Genus RETINA.

Walk., Cat. Lep. Het., ii, p. 438 (1854).

224. *Retina costata.*

Retina costata, Walk., Cat. Lep. Het., ii, p. 439 (1854); Butl., Ill. Typ. Lep. Het., iii, pl. xliii, fig. 7 (1879).

I have received this species from Chang-yang, Ichang, Kiukiang, Omei-shan, and the province of Kwei-chow. The specimen from the last-named locality is a female; this and also two examples of the same sex from Omei-shan have the band as broad as in the male, but in three other females from Omei-shan the band is narrower than in the male. In the Omei-shan specimens the band is orange-red instead of crimson.

Distribution. NORTH, CENTRAL, and WESTERN CHINA.

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225. *Retina rubiginosa*, sp. n.

Primaries pinkish tinged with fuscous on basal area; there is a black streak under median nervure from the base to beyond the middle: apex bordered with black. Secondaries black. Under-surface as above but the basal area of secondaries is tinged with grey. Expanse 42 millim.

One male specimen from the province of Kwei-chow, taken in June or July.

Hab. WESTERN CHINA.

Genus PIDORUS.

Walk.; Hampson, Fauna Brit. Ind., Moths, i, p. 254 (1892).

226. *Pidorus glaucopis.*

Bombyx glaucopis, Drury., Ill. Exot. Entom., ii, p. 11, pl. vi, fig. 4 (1773).

Pidorus atratus, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 401 (1877); Ill. Typ. Lep. Het., ii, p. 9, pl. xxiii, fig. 9 (1878).

Pidorus glaucopis, Leech, Proc. Zool. Soc. Lond., 1888, p. 613; Hampson, Fauna Brit. Ind., Moths, i, p. 255 (1892).

Several specimens from Yokohama in Pryer's collection. I obtained the species at Shimonoseki and Tsuruga and my collectors at Hakone, Gensan, and Kia-ting-fu. Butler records it from Hakodate as well as from Yokohama.

Variable in size and in the width and shape of the white band of the primaries.

Distribution. SIKHIM; BHUTAN; NÁGAS; CACHAR; SYLHET (*Hampson*); JAPAN; YESSO; COREA; WESTERN CHINA.

227. *Pidorus remota.*

Eterusia remota, Walk., Cat. Lep. Het., ii, p. 431 (1854).

Laurion remota, Butl., Ill. Typ. Lep. Het., ii, p. 9, pl. xxiii, fig. 10 (1878).

There were examples from Yokohama, Nikko, and Tokio in Pryer's collection. I took specimens at Fushiki, Tsuruga, and Gensan; Fixsen records it from Corea.

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Three specimens have been received from Kia-ting-fu and one from Chang-yang.

The species varies in size, the average expanse being 57 millim. In some specimens the band of the primaries is much broader than in the type and in others the white portion of the secondaries is much obscured by enlargement of the central black band; in others again the central band of the secondaries is much reduced.

Distribution. JAPAN; COREA; NORTH, CENTRAL, and WESTERN CHINA.

228. *Pidorus geminus.*

Laurion gemina, Walk., Cat. Lep. Het., ii, p. 427 (1854).
Pidorus geminus, Hampson, Fauna Brit. Ind., Moths, i, p. 254 (1892).

One male specimen captured at Omei-shan in May or June.

Distribution. HONGKONG; SIKHIM; SYLHET; MOULMEIN; CAMBODIA; BORNEO (*Hampson*); WESTERN CHINA.

229. *Pidorus euchromoides.*

Eterusia euchromoides, Walk., Cat. Lep. Het., Suppl., i, p. 120 (1864).
Laurion euchromoides, Kirby, Cat. Lep. Het., i, p. 53 (1892).

Two male specimens and one female taken at Gensan in July.

Distribution. NORTHERN CHINA; COREA.

230. *Pidorus fasciatus*, sp. n.

♂ All the wings black with a yellow central fascia, broadest on secondaries. The fascia on primaries is oblique, sometimes slightly curved; fascia of secondaries curved and slightly indented on its inner edge. Under surface as above.

♀ The fascia on all the wings rather broader.

Expanse 38—41 millim.

Three male specimens and five females from Omei-shan, and one male from Moupin; all taken in May and June.

Hab. WESTERN CHINA.

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Genus ARBUDAS.

Moore, Lep. Atk., p. 19 (1879).

231. *Arbudas albofascia*, sp. n.

Frons metallic green, palpi black above whitish beneath; thorax violet, metallic; abdomen bronzy green. Primaries blackish, the basal area tinged with metallic green and violet, and limited by an almost straight whitish fascia, the outer edge of which is irregular. Secondaries white with a black outer marginal border wide towards costa but narrow before and angle.

Expanse 16—20 millim.

Five male specimens and two females from Ta-chien-lu, taken in July.

Hab. WESTERN CHINA.

Genus HERPA.

Walk., Cat. Lep. Het., ii, p. 441 (1854).

232. *Herpa ochracea*, sp. n.

Allied to *H. venosa*, Walk., but the wings are pale ochreous in colour and the thorax and abdomen are entirely black; the inner margin of primaries and the apical and outer marginal areas of secondaries suffused with blackish.

Expanse 40 millim.

One male specimen taken at Wa-shan in July.

Hab. WESTERN CHINA.

Oberthür (Etud. d'Entom., xv, p. 21) refers to a form of *H. venosa*, Walk., which he obtained from Kouy-Tchéou. He gives it the name *sinica* and says that it is smaller and whiter than *venosa*; possibly this may be identical with the insect described above.

233. *Herpa venosa*.

Herpa venosa, Walk., Cat. Lep. Het., ii, p. 442 (1854); Hampson, Fauna Brit. Ind., Moths, i, p. 257 (1892).

Herpa venosa var. *sinica*, Oberth., Etud. d'Entom., xv, p. 21 (1891).

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Alphéraky records a large female taken at Ta-chien-lu, in June, which he says agrees with the typical form from India.

As previously stated, var. *sinica*, Oberth., from the province of Kwei-chow (Kouy-Tchéou) is described as being smaller and whiter than typical *H. venosa*.

Distribution. KHÁSIS (*Hampson*); WESTERN CHINA.

234. *Herpa luteola*, sp. n.

Head black, tegulæ yellow; thorax and abdomen bluish-black, underside of the latter ochreous. Primaries pale buff, venation and margins black. Secondaries pale yellow, venation and outer margins black except vein 1*a* and basal portions of veins 1*b*, *c*.

Vein 11 of primaries is nearer to 12 than to 10.

Expanse 30 millim.

One female specimen from Wa-shan; taken in July.

Hab. WESTERN CHINA.

Allied to *H. primulina*, Elwes.

235. *Herpa basiflava*.

Herpa basiflava, Oberth., Etud. d'Entom., xv, p. 21, pl. iii, fig. 25 (1891).

Specimens were received from Ta-chien-lu, Wa-ssu-kow, and Chi-tou, twelve in all (10 ♂ 2 ♀); they were obtained in July.

In most of my examples the venation is broadly black and the inner margin of the primaries and outer marginal area of the secondaries are suffused with the same colour.

Hab. WESTERN CHINA.

Genus HETERUSIA.

Eterusia, Hope, Trans. Linn. Soc. Lond., xviii, p. 445 (1841).

Heterusia, Hampson, Fauna Brit. Ind., Moths, i, p. 259 (1892).

236. *Heterusia tricolor*.

Eterusia tricolor, Hope, Trans. Linn. Soc. Lond., xviii, p. 445, pl. xxxi, fig. 4 (1841).

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Heterusia tricolor, Hampson, Fauna Brit. Ind., Moths, i, p. 260 (1892).

One male specimen taken in June at Omei-shan. This differs from Indian examples of the same sex in the more orange colour of the basal area of the secondaries and in the neuration on this portion of the wing being less conspicuous.

Distribution. SIKHIM; SYLHET; NEPAL; Nágas: E. PEGU (*Hampson*); WESTERN CHINA.

237. *Heterusia magnifica.*

Eterusia magnifica, Butl., Trans. Ent. Soc. Lond., 1879, p. 5; Ill. Typ. Lep. Het., v, p. 20, pl. lxxxiii, fig. 2 (1881).

Heterusia magnifica, Hampson, Fauna Brit. Ind., Moths, i, p. 261 (1892).

Four specimens from the province of Kwei-chow, taken in June or July.

Except that the markings of the primaries are creamy white, Chinese specimens agree very well with Indian examples.

Distribution. SIKHIM; ASSAM; NÁGAS; SYLHET; CACHAR (*Hampson*); WESTERN CHINA.

238. *Heterusia ædea.*

Papilio ædea, Clerck, Icon., pl. iv, fig. 2 (1759).

Eterusia ædea, Kirby, Cat. Lep. Het., i, p. 50 (1892).

Heterusia ædea, Hampson, Fauna Brit. Ind., Moths, i, p. 262 (1892).

Common at Kiukiang; the specimens received from that locality are mostly females. The species also occurs at Chang-yang, Omei-shan, Chia-ting-fu, and in the province of Kwei-chow.

Distribution. SYLHET (*Hampson*); CENTRAL and WESTERN CHINA.

Genus MILLERIA.

Herr.-Schäff.; Hampson, Fauna Brit. Ind., Moths, i, p. 262 (1892).

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239. *Milleria virginalis.*

Milleria virginalis, Herr.-Schäff., Auss. Schmett., fig. 4 (1853); Hampson, Fauna Brit. Ind., Moths, i, p. 263 (1892).
Cyclosia fuliginosa, Walk., Cat. Lep. Het., ii, p. 418 (1854).
Milleria fuliginosa, Butl., Ill. Typ. Lep. Het., v, p. 22, pl. lxxxiii, fig. 6 (1881).

One male specimen and two females from Omei-shan and one male from Chi-ting-fu, all taken in June, are referable to var. *fuliginosa*, Walk.

Distribution. SIKHIM; SYLHET; BURMA (*Hampson*); WESTERN CHINA.

Genus CHALCOSIA.

Hübn., Verz. Schmett., p. 173 (1818).

240. *Chalcosia thallo.*

Papilio thallo, Linn., Syst. Nat., i (2), p. 756 (1767).
Sphinx thallo, Don., Ins. China, pl. xli, fig. 2 (1798).
Chalcosia thallo, Kirby, Cat. Lep. Het., i, p. 45 (1892); Hampson, Fauna Brit. Ind., Moths, i, p. 266 (1892).
Sphinx pectinicornis, Linn., Syst. Nat., i, p. 807.
Bombyx tiberina, Cram., Pap. Exot., i, p. 52, pl. xxxii, figs. C, D (1775).

Probably a Southern Chinese species.

Distribution. CHINA; NORTH INDIA; CEYLON (*Hampson*).

241. *Chalcosia guerini.*

Gynautocera pectinicornis, Guér., Deless. Souv. Inde, ii, p. 88, pl. xxiv, fig. 4 (1843).
Chalcosia guerini, Kirby, Cat. Lep. Het., i, p. 45 (1892).

Probably a Southern Chinese species.

Hab. CHINA.

242. *Chalcosia suffusa*, sp. n.

Basal half of primaries chocolate-brown, marked with white on the nervures, and limited by large black patches (one in cell and one in each interspace below); the inner margin is tinged with metallic blue; beyond the black spots there is a broad white band ex-

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tending from costa to first vein and interrupted by the neuration above; outer marginal area black with a series of subapical white spots, the neuration on this portion of the wing is chocolate brown. Secondaries white with a broad black band on outer marginal area; the space between the cell and vein 1*b* more or less suffused with fuscous; venation on outer marginal area metallic blue and the anal angle is tinged with the same colour. Expanse 65—70 millim.

A long series, including both sexes, taken in June and July at Omei-shan, and one male from Chia-ting-fu, captured in July.

Hab. WESTERN CHINA.

Allied to *C. idæoides*, H.-S., but, apart from the different colour of the primaries, it is at once separated by the crimson collar being without blue spots.

242A. *Chalcosia reticularis*, sp. n.

♀ Head and antennæ with green reflection, collar crimson. Primaries creamy white, venation broadly black, especially on outer area; the basal third streaked with black between the veins, and there are two diffuse black transverse bands, the first oblique and the second undulated; outer marginal area black. Secondaries creamy white with an indented black band from costa to vein 2, this is interrupted by the venation, which is metallic green on the outer arta of the wing; fringes black preceded by a line of metallic green between vein 2 and outer angle. Under surface creamy white: primaries have a metallic green patch in the basal half of the discal cell and a black band, the latter interrupted by the venation, which is metallic green on outer portion of the wing: secondaries as above but the band is narrower. Expanse 88 millim.

One female example taken by a native collector to the north of Ta-chien-lu.

Hab. WESTERN CHINA.

The species appears to be most nearly allied to *C. idæoides*, from Northern India.

243. *Chalcosia syfanica.*

Arbudas syfanica, Oberth., Etud. d'Entom., xix, p. 33, pl. vi, fig. 43 (1894).

Oberthür described this species from two male specimens, received from Tâ-Tsien-Loû

Hab. WESTERN CHINA.

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Alphéraky (Rom. sur. Lép., ix, p. 125) records two specimens, one from the province of Gan-sou, and the other from the valley of the river Fou-bian; these he says have considerable resemblance to both "*Arbudas*" *syfanica* and "*A.*" *thibetana*, but do not agree exactly with either, and suggests that all may be forms of one species.

244. *Chalcosia thibetana.*

Arbudas thibetana, Oberth., Etud. d'Entom., xix, p. 32, pl. vi, fig. 44 (1894).

Hab. WESTERN CHINA.

245. *Chalcosia alpherakyi*, sp. n.

♂ Differs from *C. thibetana*, Oberth., as figured, in its larger size, and the metallic green colour of primaries; the neuration is not marked with white, the white transverse band is broader and not connected with the costa to form a Y-shaped mark. In shape it more resembles *C. syfanica*, from which species, however, it can readily be separated by the absence of white basal band and yellow markings on thorax and abdomen.

♀ Agrees with the male except that the band of primaries is broader and the marginal band of secondaries is absent.

Expanse 32–38 millim.

Six male specimens and three females were taken at How-kow, on the Thibetan frontier, at an elevation of 10,000 feet; June and July.

Hab. WESTERN CHINA.

Genus CYCLOSIA.

Hübn.; Hampson, Fauna Brit. Ind., Moths, i, p. 269 (1892).

246. *Cyclosia papilionaris.*

Noctua papilionaris, Drury, Ill. Exot. Ent., ii, p. 4, pl. ii, fig. 4 (1773).

Milleria papilionaris, Kirby, Cat. Lep. Het., i, p. 43 (1892).

Cyclosia papilionaris, Hampson, Fauna Brit. Ind., Moths, i, p. 269 (1892).

Probably occurs in Southern China only.

Distribution. CHINA; SIKHIM; KHÁSIS; BURMA; MERGUI; JAVA (*Hampson*).

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Genus ERASMIA.

Hope, Trans. Linn. Soc. Lond., xviii, p. 446 (1841).

247. *Erasmia pulchella.*

Erasmia pulchella, Hope, Trans. Linn Soc., xviii, p. 446, pl. xxxi, fig. 5 (1841).

A fine series from Chia-ting-fu, and one example from the province of Kwei-chow, all taken in June and July.

The Chinese specimens differ from the Indian type in having smaller blue spots on the primaries, and a broader outer marginal border to the secondaries.

Distribution. SIKHIM; ASSAM; NÁGAS; SYLHET (*Hampson*); WESTERN CHINA.

248. *Erasmia sangaica.*

Erasmia sangaica, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 86 (1877).

Moore describes this species from Shanghai.

Hab. NORTH-EASTERN CHINA.

Genus CAMPYLOTES.

Westw., Royle's Botany of Himalayas, Lep., p. liii. (1839).

249. *Campylotes histrionicus.*

Campylotes histrionicus, Westw., Royle's Botany of Himalayas, Lep., p. liii, pl. x, fig. 1 (1839); Hampson, Fauna Brit. Ind., Moths, i, p. 274 (1892).

I have a series from the province of Kwei-chow; the specimens were taken in June and July.

Distribution. Throughout the HIMALAYAS; KHÁSIS (*Hampson*); WESTERN CHINA.

250. *Campylotes romanovi*, sp. n.

Blue-black with markings as in *C. histrionicus* from the North-west Himalayas; the spots on apical area, with the exception of three near costa, are not subhyaline whitish as in *C. histrionicus*; the

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tegulæ are crimson instead of yellow, and there are no yellow markings on the abdomen or on the legs.

Expanse 70—85 millim.

A very fine series, including both sexes, from Moupin, and one specimen from Wa-shan; June.

Hab. WESTERN CHINA.

251. *Campylotes desgodinsi.*

Epyrgis desgodinsi, Oberth., Etud. d'Entom., ix, p. 18, pl. ii, fig. 10 (1884).

Campylotes desgodinsi, var. *splendida*, Elwes, Proc. Zool. Soc. Lond., 1890, p. 384, pl. xxxiii, fig. 3.

Occurs at Moupin and most of the localities in Western China that my collectors visited; June and July.

Many of the specimens have a distinct basal band on the primaries.

Distribution. NÁGAS (*Hampson*); WESTERN CHINA.

252. *Campylotes pratti.*

Campylotes pratti, Leech, Entom., xxiii, p. 109 (1890).

I have only received this species from Chang-yang, with the exception of one example from Pu-tsu-fong, in which the basal band of the primaries is absent, the spots on the apical area are whitish, and all the discal markings are reddish ochreous in colour.

Hab. CENTRAL and WESTERN CHINA.

253. *Campylotes minima.*

Campylotes minima, Oberth., Etud. d'Entom., xix, p. 25, pl. vi, fig. 54 (1894).

One example of each sex from Omei-shan, and a male from Ta-chien-lu, taken in June and July.

Hab. WESTERN CHINA.

Genus HISTIA.

Hübn., Verz. Schmett., p. 198 (1818).

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254. *Histia flabellicornis.*

Zygæna flabellicornis, Fabr., Sp. Ins., ii, p. 163 (1781).
Histia flabellicornis, Hübn., Verz. Schmett., p. 198 (1816).
Papilio rhodope, Cram., Pap. Exot., i, pl. xxx, fig. F. (1775).
Histia rhodope, Kirby, Cat. Lep. Het., p. 55 (1892).

One male specimen from Fung-tu, taken in September, two females from Ichang, and one from Chia-ting-fu, captured in July, and one example of the same sex from Kiukiang obtained in August.

There was a specimen in Pryer's collection from Loochoo.

The blue colour in the secondaries of the females is suffused with blackish, and only shows in certain lights.

Distribution. HONG-KONG; SIKHIM; ASSAM; KHÁSIS; NÁGAS; BURMA (*Hampson*); CENTRAL and WESTERN CHINA; LOOCHOO.

Genus AGALOPE.

Wàlk., Cat. Lep. Het., ii. p. 437 (1854).

255. *Agalope davidi.*

Chalcosia davidi, Oberth., Etud. d'Entom., ix, p. 19, pl. i, fig. 2 (1884).
Agalope davidi, Kirby, Cat. Lep. Het., i, p. 57 (1892).

This appears to be a common species at Chang-yang, and Moupin in June; it also occurs at Omei-shan, Ni-tou, Chow-pin-sa, and Chia-Kou-ho.

Hab. CENTRAL and WESTERN CHINA.

256. *Agalope immaculata*, sp. n.

All the wings semi-transparent. Primaries creamy-white, neuration fuscous; there is a small yellow patch at the base, and the inner area is tinged with yellow. Secondaries whiter than primaries; the venation is distinct but not tinged with fuscous. Under surface as above. Expanse 56 millim.

One male specimen from Ta-chien-lu, taken in July.

Hab. WESTERN CHINA.

Allied to *A. davidi*, Oberth., but separable from that species by the absence of markings and by the longer pectinations of the antennæ.

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257. *Agalope livida.*

Agalope livida, Moore, Proc. Zool. Soc. Lond., 1879, p. 391.

Probably a Southern Chinese species.
Hab. CHINA.

Genus CHELURA.

Hope, Trans. Linn. Soc. Lond., xviii, p. 444 (1840).

258. *Chelura eronioides.*

Chelura eronioides, Moore, Lep. Atk., p. 15 (1857).
Achelura eronioides, Kirby, Cat. Lep. Het., i, p. 56 (1892).

One example of each sex from Moupin, and four females from Omei-shan, all captured in June.
Distribution. SIKHIM (*Hampson*); WESTERN CHINA.

259. *Chelura bieti.*

Chalcosia bieti, Oberth., Etud. d'Entom., xi, p. 29, pl. vi, fig. 40 (1886).
Agalope bieti, Kirby, Cat. Lep. Het., i, p. 57 (1892).

Oberthür describes this species from Ta-chien-lu. It seems to be very closely allied to *C. eronioides*. My collectors did not meet with it.
Hab. WESTERN CHINA.

260. *Chelura dejeani.*

Agalope dejeani, Oberth., Etud. d'Entom., xviii, p. 20, pl. ii, fig. 24 (1893).

Four male specimens from the high plateau to the north of Ta-chien-lu.
Hab. WESTERN CHINA.

Genus ELCYSMA.

Butl., Trans. Ent. Soc. Lond., 1881, p. 4.

261. *Elcysma westwoodii.*

Agalope westwoodii, Voll., Tijdschr. Ent., vi, p. 136, pl. ix, fig. 3 (1863).

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Elcysma translucida, Butl., Trans. Ent. Soc. Lond., 1881, p. 4.

Elcysma westwoodii, Elwes, Proc. Zool. Soc. Lond., 1890, p. 386, pl. xxxiv, fig. 5.

There were three specimens in Pryer's collection, one of which is from Gifu; my native collector obtained a female example at Gensan in August.

Dr. Staudinger (Rom. sur Lép., vi, p. 248) considers *E. caudata*, Brem., from Amurland to be a local form of this species.

Distribution. AMURLAND (*Staudinger*); JAPAN; CHINA; COREA.

Subfamily *PHAUDINÆ*.

Genus PHAUDA.

Walk., Cat. Lep. Het., i, p. 256 (1854).

262. *Phauda triadum*.

Euchromia triadum, Walk., Cat. Lep. Het., i, p. 257 (1854).

Xenares fortunii, Herr.-Schäff., Auss. Schmett., i, p. 223, (1854).

Phauda fortunii, Butl., Ill. Typ. Lep. Het., i, p. 20, pl. ix, fig. 3 (1877).

Two specimens from Kiukiang taken in June.

Hab. NORTHERN and CENTRAL CHINA.

263. *Phauda pratti*.

Phauda pratti, Leech, Entom., xxiii, p. 81 (1890).

The type was from Ichang; I have since received a specimen from Moupin, taken in June, and one from Wa-shan, captured in July.

Hab. CENTRAL and WESTERN CHINA.

Genus PRYERIA.

Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 85 (1877).

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264. *Pryeria sinica.*

Pryeria sinica, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 86 (1877).

A long series from Yokohama in Pryer's collection.
Distribution. NORTHERN CHINA; JAPAN.

Family PSYCHIDÆ.

Subfamily *ŒCETICINÆ.*

Genus CLANIA.

Walk.; Hampson, Fauna Brit. Ind., Moths, i, p. 291 (1892).

265. *Clania variegata.*

Oiketicus variegatus, Snell., Tijdschr. Ent., xxii, p. 114, pl. ix, fig. 6 (1879).
Eumeta pryeri, Moore; Leech, Proc. Zool. Soc. Lond., 1888, p. 598.
Clania variegata, Hampson, Fauna Brit. Ind., Moths, i, p. 291 (1892).

Two specimens from Yokohama in Pryer's collection and I have one from Nikko.
Distribution. SHANGHAI; CANARA; NILGIRIS; CEYLON; BORNEO; CELEBES (*Hampson*); JAPAN.

266. *Clania japonica.*

Eumeta japonica, Heyl., C. R. Soc. Ent. Belg., xxviii, p. xl (1884).

Male type, with pupa and pupa-case, described from specimen received from Tokio by M. Heylaerts.
It appears to be very closely allied to *C. variegata.*
Hab. JAPAN.

267. *Clania minuscula.*

Eumeta minuscula, Butl., Trans. Ent. Soc., 1881, p. 22.

There were specimens from Yokohama in Pryer's collection; I bred a specimen at Nagasaki, and I have eleven examples from Ichang, taken in August.
Distribution. JAPAN; KIUSHIU; CENTRAL CHINA.

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Subfamily *PSYCHINÆ*.

Genus ACANTHOPSYCHE.

Heyl., Ann. Soc. Ent. Belg., 1881, p. 66.

268. *Acanthopsyche bipars.*

Perina bipars, Walk., Cat. Lep. Het., xxxii, p. 406 (1865).
Acanthopsyche (*Œceticoides*) *bipars*, Hampson, Fauna Brit. Ind., Moths, i, p. 293 (1892).
Kophene bipars, Kirby, Cat. Lep. Het., i, p. 506 (1892).

One specimen in Pryer's collection; exact locality not indicated.
Distribution. BOMBAY (*Hampson*); JAPAN.

Genus PLATEUMETA.

Butl., Trans. Ent. Soc. Lond., 1881, p. 22.

269. *Plateumeta aurea.*

Plateumeta aurea, Butl., Trans. Ent. Soc. Lond., 1881, p. 22.

Two examples from Yokohama in Pryer's collection.
Hab. JAPAN.

Genus PSYCHE.

Schrank, Fauna Boica, ii (2), p. 87 (1802).

270. *Psyche viciella.*

Tinea viciella, Schiff., Syst. Verz. Lep. Wien., pp. 133, 288, pl. i, fig. 7. (1776).
Psyche viciella, Kirby, Cat. Lep. Het., i, p. 515 (1892).

One specimen of var. *stetinensis*, Her., in Pryer's collection without locality.
Distribution. EUROPE.—JAPAN.

271. *Psyche unicolor.*

Bombyx unicolor. Hufn., Berl. Mag., ii, p. 418 (1766).
Canephora unicolor, Kirby, Cat. Lep. Het., i, p. 509 (1892).
Psyche unicolor, var. *asiatica*, Staud., Stett. Ent. Zeit., 1887, p. 94.

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There were several specimens in Pryer's collection from Yokohama and Yesso; these are referable to var. *asiatica*, Staud.

Distribution. EUROPE.—AMURLAND; JAPAN; YESSO; FOOCHAU.

Family COSSIDÆ.

Genus COSSUS.

Fabr.; Hampson, Fauna Brit. Ind., Moths, i, p. 305 (1892).

272. *Cossus ligniperda.*

Bombyx cossus, Linn., Syst. Nat., i, p. 504 (1858); Hübn., Eur. Schmett., Bomb., fig. 198.

Cossus ligniperda, Fabr., Ent. Syst., iii, p. 3 (1794).

Trypanus cossus, Kirby, Cat. Lep. Het., i, p. 860 (1892).

Cossus cossus, Fixsen, Rom. sur Lép., iii, p. 337 (1887).

Fixsen records this species from Corea. Staudinger (Rom. sur Lép., vi, p. 291) refers to a specimen which he received from Hertz, who took it in the north of Pekin, as *Cossus cossus*; from his description of this example, however, it would seem to be *C. vicarius*.

Distribution. EUROPE.—AMURLAND; COREA; ? NORTH CHINA.

273. *Cossus vicarius.*

Cossus vicarius, Walk., Cat. Lep. Het., xxxii, p. 584 (1865).

Trypanus vicarius, Kirby, Cat. Lep. Het., i, p. 861 (1892).

There were two specimens in Pryer's collection but without data. I took a male at Gensan and I have received one taken by a native collector at Nikko. My collectors in China appear to have met with the species at Ta-chien-lu only where one female example was obtained.

Distribution. JAPAN; COREA; NORTH and WESTERN CHINA.

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274. *Cossus acronyctoides.*

Brachylia acronyctoides, Moore, Proc. Zool. Soc. Lond., 1879, p. 411, pl. xxxiv, fig. 4.
Cossus acronyctoides, Hampson, Fauna Brit. Ind., Moths, i, p. 305 (1892).

One male specimen taken at Wa-shan in May.
Distribution. KASHMIR; GANJAM; BOMBAY; MHOW; NILGIRIS (*Hampson*); WESTERN CHINA.

Genus AZYGOPHLEPS.

Hampson, Fauna Brit. Ind., Moths, i, p. 309 (1892).

275. *Azygophleps albofasciata.*

Zeuzera albofasciata, Moore, Lep., Atk., i, p. 87 (1879).
Azygophleps albofasciata, Hampson, Fauna Brit. Ind., Moths, i, p. 309 (1892).

A female specimen taken in July at Chia-kou-ho.
Distribution. KASHMIR; SIKHIM (*Hampson*); WESTERN CHINA.

Genus ZEUZERA.

Latr., Nouv. Dict. d'Hist. Nat., xxiv, p. 186 (1804); Steph., Ill. Brit. Ent. Haust., ii, p. 8 (1828).

276. *Zeuzera pyrina.*

Noctua pyrina, Linn. Faun. Suec., p. 306 (1761).
Noctua æsculi, Linn., Syst. Nat., i, p. 833 (1767).
Bombyx æsculi, Hübn., Bomb., fig. 202 (1804 ?).
Zeuzera pyrina, Kirby, Cat. Lep. Het., i, p. 871 (1892).

One example in Pryer's collection and one from Gensan taken in July.
Distribution. EUROPE.—JAPAN; COREA.

277. *Zeuzera leuconotum.*

Zeuzera leuconotum, Butl., Trans. Ent. Soc. Lond., 1881, p. 22.

I have one example of each sex from Moupin, and one small male specimen from Ta-chien-lu, all taken in July. There was one male in Pryer's collection from Yokohama.

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Z. multistrigata, Moore, is very closely allied to *Z. leuconotum* if it is not specifically identical with it.

Distribution. JAPAN; WESTERN CHINA.

Genus PHRAGMATŒCIA.

Newm., Zoologist, vii, p. 2931 (1850).

278. *Phragmatœcia castaneæ.*

Bombyx castaneæ, Hübn.; Esp., Schmett., p. 94, pl. xciv, figs. 1, 2 (1807).

Bombyx arundinis, Hübn., Bomb., pl. xlvii, figs. 200, 201 (1803).

Zeuzera innotata, Walk., Cat. Lep. Het., xxxii, p. 587 (1865).

Phragmatœcia castaneæ, Hampson, Fauna Brit. Ind., Moths, i, p. 313 (1892); Kirby, Cat. Lep. Het., p. 876 (1892).

Phragmatœcia castaneæ, Hb., var. *pygmæa*, Graes, Staud., Rom. sur Lép., vi, p. 293 (1892).

Occurs in July and August at Yokohama and Hakodate.

Distribution. EUROPE.—AMURLAND; JAPAN; YESSO; NORTH-EASTERN CHINA; NILGIRIS; AFRICA.—CEYLON.—MADAGASCAR.

Family HEPIALIDÆ.

Genus PHASSUS.

Walk.; Hampson, Fauna Brit. Ind., Moths, i, p. 318 (1892).

279. *Phassus signifer.*

Phassus signifer, Walk., Cat. Lep. Het., vii, p. 1568 (1856); Butl., Ill. Typ. Lep. Het., v, pl. cix, fig. 2 (1886); Hampson, Fauna Brit. Ind., Moths, i, p. 320 (1892).

Phassus sinensis, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 94 (1877).

Phassus herzi, Fixsen, Rom. sur Lép., iii, p. 335, pl. xv, fig. 3 (1887).

I have examples of this variable species from Yoko-

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hama, Oiwake, Satsuma, Shimoneseki, Gensan, Ichang, and Moupin.

The silvery mark at the outer end of the cell may be bar-like, geminate, or punctiform, but it is not entirely absent in any of my specimens; other silvery marks are found at the base of the cell (always present) and towards the apex of the primares.

Distribution. SYLHET; BERNARDMYO; BURMA; E. PEGU; BORNEO (*Hampson*); JAPAN; COREA; CENTRAL, WESTERN and NORTH-EASTERN CHINA.

280. *Phassus marginenotatus*, sp. n.

Primaries brownish, sparsely striated with darker, the costal and central areas are variegated with golden brown; there is a diffuse, oblique, dark brown, sub-basal band, a patch of the same colour beyond the cell, and some dark brown quadrate spots on the apical half of the costa; fringes of the ground colour, preceded by silvery white dots. Secondaries and undersurface of all the wings fuliginous. Expanse 70 millim.

One male specimen from Omei-shan, taken in June or July.

Hab. WESTERN CHINA.

281. *Phassus davidi.*

Hepialus davidi, Pouj., Bull. Soc. Ent. Fr., (6) vi, p. xcii (1886).

Described from specimens received from Moupin. I have four examples from Chia-kou-ho, taken in July and August.

Hab. WESTERN CHINA.

282. *Phassus excrescens.*

Hepialus excrescens, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 482 (1877); Ill. Typ. Lep. Het., ii, p. 20, pl. xxvii, fig. 7 (1878).

Phassus excrescens, Kirby, Cat. Lep. Het., i, p. 889 (1892).

Hepialus æmulus, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 482 (1877); Ill. Typ. Lep. Het., ii, p. 20, pl. xxvii, fig. 8 (1878).

Phassus excrescens, Leech, Proc. Zool. Soc. Lond., 1888, p. 645.

A variable species. I have specimens from Yokohama Hakodate and Kiushiu.

Distribution. JAPAN, YESSO and KIUSHIU; AMURLAND.

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Genus HEPIALUS.

Fabr., Syst. Ent., p. 589 (1775).

283. *Hepialus velleda.*

Bombyx velleda, Hübn., Bomb., figs. 212, 233, 234 (1814).
Hepialus fusconebulosus, Kirby, Cat. Lep. Het, i, p. 880 (1892).

One example which appears to be referable to the greyish form of this species was received from Ichang where it was captured in June.

Distribution. EUROPE.—AMURLAND; CENTRAL CHINA.

284. *Hepialus hectus.*

Noctua hectus, Linn., Syst. Nat., i, App., p. 822 (1858).
Bombyx hectus, Hübn., Bomb., figs. 208, 209, 258 (1804 ?).
Hepialus hectus, Kirby, Cat. Lep. Het., i, p. 883 (1892).

There were two specimens from Yesso in Pryer's collection.

Distribution. EUROPE.—AMURLAND; YESSO.

285. *Hepialus nebulosus.*

Hepialus nebulosus, Alph., Rom. sur Lép., v, p. 85 (1889).

One specimen from Chia-kou-ho and one from Wa-shan appear to be referable to this species which Alphéraky describes from North-East Thibet. Possibly it may be a form of *H. velleda*.

Distribution. NORTH-EAST THIBET; WESTERN CHINA.

Genus GORGOPIS.

Hübn., Verz. Schmett., p. 198 (1822 ?).

286. *Gorgopis niphonica.*

Gorgopis niphonica, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 357 (1879).

Two specimens from the foot of Ohoyama, near Yokohama, in Pryer's collection; I obtained one example at Tsuruga in July.

Hab. JAPAN.

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Family CALLIDULIDÆ.

Genus PTERODECTA.

Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 399 (1877).

287. *Pterodecta felderi.*

Callidula felderi, Brem., Lep. Ost-Sib., p. 38, pl. iv, fig. 3 (1864).

Pterodecta gloriosa, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 399 (1877); Ill. Typ. Lep. Het., ii, p. 8, pl. xxiii, fig. 4 (1878).

Specimens from Yokohama, Yamato, and Fujisan in Pryer's collection. I obtained the species at Nagahama and Tsuruga and my collectors at Chang-yang and at most of the localities in Western China that they visited.

Distribution. AMURLAND; CENTRAL and WESTERN CHINA; JAPAN.

Genus HERIMBA.

Moore, Lep. Atk., p. 20 (1879).

288. *Herimba nigropuncta*, sp. n.

Head, palpi, and thorax black, marked with yellow; abdomen, black, with yellow dorsal line and bands.

Primaries white, basal area yellow; costal area and inner margin spotted with black; basal, sub-basal, submarginal, and marginal bands indicated by black spots, which are often confluent especially on outer margin; there is a large black spot at end of cell and one beyond middle of inner margin; a wavy and sometimes interrupted yellow line separates the marginal from the submarginal series of spots, and there are spurs of the same colour along the venation. Secondaries white, with one or two black spots at the base, a sub-basal band represented by a large black spot towards costa, and a similar one with two smaller on inner margin; marginal and submarginal bands indicated by black spots, but the latter is irregular, and the spots absent between veins 4 and 7; marginal line yellow, terminating in a diffuse yellow patch at anal angle. Fringes black, marked with yellow at anal angle of secondaries.

Expanse, ♂ 32—34 millim., ♀ 36 millim.

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Specimens were received from Chang-yang, Chia-ting-fu, and Chia-kou-ho; they were taken in June and July.

Hab. CENTRAL and WESTERN CHINA.

The markings are subject to considerable modification. In some examples the costal spots are confluent, forming a broad black border.

289. *Herimba flavilinea*, sp. n.

Similar to *H. nigropuncta*, but the yellow markings are more prominent, the sub-basal black band of secondaries is more complete and separated from the marginal band by a yellow line as on primaries; the spots forming the marginal band are sometimes surrounded by yellow. Expanse ♂ 26—34 millim., ♀ 36 millim.

Four male specimens from Wa-ssu-kow and one female from Ni-tou. Occurs in June and July.

Hab. WESTERN CHINA.

290. *Herimba trachiaria.*

Abraxas trachiaria, Oberth., Etud. d'Entom., xviii, p. 35, pl. ii, fig. 21 (1893).

Described from a female specimen taken in May somewhere between Ta-chien-lu and Moupin.

I have one example from Moupin and one from Omei-shan, both captured in July.

Hab. WESTERN CHINA.

Family DREPANULIDÆ.

Genus EUCHERA.

Hübn., Hampson, Fauna Brit. Ind., Moths, i, p. 327 (1892).

291. *Euchera capitata.*

Abraxas capitata, Walk., Cat. Lep. Het., xxiv, p. 1121 (1862).

Cyclidia capitata, Kirby, Cat. Lep. Het., p. 725 (1892).

There were specimens of this very variable species from Ohoyama and Fujisan in Pryer's collection. I took the species at Gensan in July and have received examples

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from Mr. Manley of Yokohama. My collectors in China obtained specimens at Ship-y-shan, Chang-yang, Wa-shan, and Chia-kou-ho. Walker's type was from Hong-kong.

Distribution. CHINA; COREA; JAPAN.

292. *Euchera fractifasciata*, sp. n.

White. Primaries with a fuscous basal patch and sub-basal band, the latter interrupted by the nervures; a central fascia, interrupted below the middle, the costal portion broad, enclosing a white spot, and the inner marginal portion represented by two almost round spots; outer margin broadly bordered with fuscous, traversed by an ill defined wavy line of the ground colour, which unites with a large patch between veins 3 and 4, in the interspaces above this patch there are whitish rings enclosing fuscous spots, but these are not well defined; there are narrow, wavy, fuscous bands between the sub-basal and central and between the central band and marginal border. Secondaries have an interrupted fuscous submarginal band, not extending to outer angle, and a series of spots of the same colour before the interrupted fuscous marginal line; there is a fuscous cloud towards anal angle between the submarginal band and the marginal spots.

Expanse, ♂ 80 millim., ♀ 90 millim.

An example of each sex taken at Wa-shan in June.

Hab. WESTERN CHINA.

293. *Euchera ociferaria.*

Cyclidia ociferaria, Walk., Cat. Lep. Het., xx, p. 56 (1860).

Walker described this species from North China; my collectors did not meet with it.

Genus MACROCILIX.

Butl., Ill. Typ. Lep. Het., vi, p. 18 (1886).

294. *Macrocilix maia.*

Argyris maia, Leech, Proc. Zool. Soc. Lond., 1888, p. 647, pl. xxxii, fig. 6.

Described from a specimen that I captured at Gensan in the month of July. I have since received another example taken in the island of Kiushiu by a native collector.

Distribution. COREA; KIUSHIU.

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295. *Macrocilix orbiferata.*

Abraxas orbiferata, Walk., Cat. Lep. Het., xxiv, p. 1126 (1862).
Macrocilix orbiferata, Hampson, Fauna Brit. Ind., Moths, i, p. 330 (1892).

Six specimens from Omei-shan, two from Moupin and one from Chia-ting-fu; all taken in June and July.

Distribution. SIKHIM; BHUTÀN; KHÁSIS; BORNEO (*Hampson*); WESTERN CHINA.

Genus MACRAUZATA.

Butl., Ill. Typ. Lep. Het., vii, p. 43 (1889).

296. *Macrauzata fenestraria.*

Comibæna fenestraria, Moore, Proc. Zool. Soc. Lond., 1867, p. 639.
Macrauzata fenestraria, Hampson, Fauna Brit. Ind., Moths, i, p. 330 (1892).

One example from Tokio in Pryer's collection.

Distribution. KÁNGRA; SIKHIM (*Hampson*); JAPAN.

Genus CALLICILIX.

Butl., Cist. Ent., iii, p. 124 (1885).

297. *Callicilix abraxata.*

Callicilix abraxata, Butl., Cist. Ent., iii, p. 124 (1885).
Platypteryx nguldoe, Oberth., Etud. d'Entom., xviii, p. 22, pl. ii, fig. 29 (1893).

There was a specimen from Yesso in Pryer's collection; my native collector obtained a male at Hakodate in July and I have received examples of both sexes from Chang-yang, Omei-shan, and Kwei-chow, also taken in July.

Oberthür's specimen was taken between Ta-chien-lu and Moupin.

The Chinese specimens are rather larger than those from Yesso and the markings are somewhat broader and heavier.

Distribution. YESSO; CENTRAL and WESTERN CHINA.

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Genus AUZATA

Walk., Cat. Lep. Het., xxvi, p. 1620 (1862).

298. *Auzata chinensis*, sp. n.

Somewhat similar to *A. superba*, but all the wings have a double antemedial pale fuscous line, and an interrupted submarginal band of the same colour; the secondaries have a patch as on primaries; fringes of all the wings pale fuscous interrupted with white at the ends of the nervules. Expanse, ♂ 38 millim., ♀ 48 millim.

I have a series of eight specimens. They were taken at Ta-chien-lu, Omei-shan, Chia-ting-fu, and in the province of Kwei-chow during the months of June and July.

Hab. WESTERN CHINA.

299. *Auzata superba.*

Argyris superba, Butl., Ill. Typ. Lep. Het., ii, p. 52, pl. xxxvii, fig. 2 (1878).

Occurs in July and August at Yokohama, Oiwake and Hakodate.

Hab. JAPAN and YESSO.

300. *Auzata minuta*, sp. n.

White. Primaries have a fuscous dot at end of the cell and a fuscous grey line beyond; the latter is angulated below costa, and thence curved to inner margin, in the hollow of this curve there is a fuscous patch tinged with ochreous and intersected by the white veins, which are here dotted with black; submarginal band fuscous grey, interrupted towards costa. Secondaries have a double central line and a submarginal band, both fuscous grey, and there are two dark dots beyond the central line and towards abdominal margin. Fringes fuscous grey, marked with white at the ends of the nervules. Expanse, ♂ 25 millim., ♀ 28—30 millim.

Occurs at Chang-yang, Ichang, Omei-shan, Chia-ting-fu, and in the province of Kwei-chow.

Hab. CENTRAL and WESTERN CHINA.

Genus TELDENIA.

Moore, Lep. Ceyl., ii, p. 119 (1882).

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301. *Teldenia sericea*, sp. n.

Silky white. Primaries traversed by four wavy, dusky, lines, the outer two submarginal and close together; secondaries have three similar lines. Expanse 30—33 millim.

Two male specimens from Moupin, taken in July.
Hab. WESTERN CHINA.

The species superficially resembles a pale marked example of *Dilinia pusaria*, Linn.

302. *Teldenia inconspicua*, sp. n.

Silky-white, powdered with fuscous scales, which assume the form of very wavy transverse lines, these are most clearly defined on the outer marginal area of all the wings. Under surface white, the costa of primaries tinged with fuscous. Expanse 33 millim.

One male specimen from Ta-chien-lu, and a female from Omei-shan, both taken in July.
Hab. WESTERN CHINA.

Genus LEUCODREPANA.

Hampson, Fauna Brit. Ind., Moths, i, p. 333 (1892).

303. *Leucodrepana idæoides.*

Leucodrepana idæoides, Hampson, Fauna Brit. Ind., Moths, i, 333 (1892).

One male specimen from Wa-shan, captured in July.
Distribution. SIKHIM; WESTERN CHINA.

304. *Leucodrepana sacra.*

Corycia sacra, Butl., Ann. and Mag. Nat. Hist., (5) i, p. 404 (1878); Ill. Typ. Lep. Het., iii, p. 44, pl. li, fig. 11 (1879).
Bapta sacra, Leech, Ann. and Mag. Nat. Hist., (6) xix, p. 198 (1897).

This species belongs to the Drepanulidæ and not to the Geometridæ, in which family I previously placed it.
Distribution. JAPAN; YESSO; COREA; CENTRAL and WESTERN CHINA.

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305. *Leucodrepana virgo.*

Corycia virgo, Butl., Ann. and Mag. Nat. Hist., (5) i, p. 404 (1878); Iil. Typ. Lep. Het., iii, p. 44, pl. li, fig. 10 (1879).

Described from Yokohama.
Hab. JAPAN.

306. *Leucodrepana? lineata*, sp. n.

Silvery white. Primaries have four dusky, transverse lines, almost parallel and nearly straight. Secondaries have four parallel, curved, dusky lines. Fringes yellowish. Under surface silvery white, basal area of primaries suffused with fuscous. Expanse 38 millim.

One male specimen from Omei-shan; July.
Hab. WESTERN CHINA.

307. *Leucodrepana nivea.*

Leucodrepana nivea, Hampson, Fauna Brit. Ind., Moths, i, p. 333 (1892).

One male specimen taken in June at Wa-shan.
Distribution. SIKHIM (*Hampson*); WESTERN CHINA.

308. *Leucodrepana thibetaria.*

Micronia thibetaria, Pouj., Ann. Soc. Ent. Fr., 1895, p. 311, pl. 6, fig. 10.

This species was described by Poujade from Moupin. I have a fine series from Ichang and Chang-yang; the specimens which are chiefly from the latter locality were taken in June and July.
Hab. CENTRAL and WESTERN CHINA.

309. *Leucodrepana quinquelineata*, sp. n.

White. Primaries have four wavy, ochreous, transverse lines, the third and fourth rather more wavy than the other two, submarginal line represented by ochreous dots on the neuration. Secondaries have three ochreous, wavy, transverse lines, the second and third appearing to be continuations of the third and fourth of primaries; submarginal line as on primaries. Under surface white; primaries fuscous on costal area. Expanse 30 millim.

One male specimen in Pryer's collection.
Hab. JAPAN.

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Genus DREPANA.

Schr.; Hampson, Fauna Brit. Ind., Moths, i, p. 333 (1892).

310. *Drepana crocea.*

Drepana crocea, Leech, Proc. Zool. Soc. Lond., 1888, p. 649, pl. xxxii, fig. 7.
Albara crocea, Kirby, Cat. Lep. Het., p. 734 (1892).

The type (a female, not a male as described) of this species was in Pryer's Japanese collection. I have since received an example of each sex from Moupin, taken in June. The female example agrees with the type in all respects, but the male is smaller (36 millim.) and has the 8-mark on the secondaries less distinct.

Distribution. JAPAN; WESTERN CHINA.

311. *Drepana rubromarginata*, sp. n.

Primaries, yellow, outer margin bordered with reddish-brown from vein 6 to inner margin,—antemedial line, blackish, undulated; postmedial line, blackish, wavy, interrupted towards costa; submarginal line blackish, wavy but indistinct towards costa and inner margin, a black spot on inner margin represents the termination of each of these lines; there are two blackish spots in the discal cell, an 8-shaped mark at end of cell, and a more or less round one below it, the upper part of 8-mark centred with whitish; the reddish marginal border is traversed by a wavy line of the ground colour. Secondaries paler with traces of transverse markings, mostly confined to abdominal area; there is a blackish spot between veins 2 and 3, and another between veins 3 and 4, the former centred with white. Expanse 33 millim.

One male specimen from Pu-tsu-fong, taken in June or July.

Hab. WESTERN CHINA.

Allied to *D. crocea.*

312. *Drepana grisearia*, sp. n.

Primaries whitish hyaline tinged with pale fuscous grey; basal patch, antemedial, medial, and postmedial bands darker, outer edge of the latter strongly defined and elbowed below costa; submarginal line diffuse running in a slight curve from apex to outer

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angle ; there is an elongate black spot on upper discocellular and two almost round ones on lower discocellular. Secondaries whitish with five fuscous grey transverse lines and bands, all indistinct towards costa ; there is a black dot at upper angle of cell and one at lower angle. Expanse 40 millim.

One male specimen from Pu-tsu-fong, taken in June or July.

Hab. WESTERN CHINA.

313. *Drepana hyalina.*

Drepana hyalina, Moore, Proc. Zool. Soc. Lond., 1888, p. 401; Butl., Ill. Typ. Lep. Het., vii, pl. cxxv, fig. 1 (1889).

One specimen from Huang-mu-chang, which agrees with examples of this species that I have from Kokser.

Distribution. DHARMSÁLA ; KULU (*Hampson*) ; WESTERN CHINA.

314. *Drepana acuminata.*

Drepana acuminata, Leech, Entom., xxiii., p. 113 (1890).
Platypteryx acuminata, Kirby, Cat. Lep. Het., p. 731 (1892).

Described from a male specimen received from Ichang.

Distribution. CENTRAL CHINA.

Drepana manleyi, sp. n.

Primaries pale ochreous brown traversed by two transverse lines ; the first line curved, slightly indented below costa, and rather indistinct ; the second line dark brown, acutely angled below costa, where it is joined by a short oblique line from the apex ; there is a black spot in the cell and the apex is purplish-brown : submarginal line brown running from angle of second line to inner margin, just before outer angle. Secondaries pale straw colour, dusted with pale ochreous brown, traversed by four brownish lines, the second most distinct and appearing to be a continuation of the second line of primaries. Under surface pale straw colour, brownish at apex as above, postmedial and submarginal lines of primaries brownish. Expanse 30—33 millim.

Two male specimens received from Mr. Manley, who captured them at Yokohama.

Hab. JAPAN.

Allied to. *D. acuminata.*

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316. *Drepana japonica.*

Drepana japonica, Moore, Ann. and Mag. Nat. Hist., (4) xx, p. 94 (1877).
Platypteryx japonica, Kirby, Cat. Lep. Het., p. 732 (1892).

I took this species at Nagasaki in June, and there were several specimens from Yokohama and Gifu in Pryer's collection.

Hab. JAPAN and KIUSHIU.

317. *Drepana vira.*

Drepana vira, Moore, Proc. Zool. Soc. Lond., 1865, p. 817; Hampson, Fauna Brit. Ind., Moths, i, p. 342 (1892).

One specimen from Moupin, taken in June.

Distribution. SIKHIM; WESTERN CHINA.

318. *Drepana scabiosa.*

Drepana scabiosa, Butl., Ann and Mag. Nat. Hist., (4) xx, p. 478 (1877); Ill. Typ. Lep. Het., ii, pl. xxv, fig. 9 (1878).
Platypteryx scabiosa, Kirby, Cat. Lep. Het., p. 732 (1892).

I have specimens from Yokohama, Oiwake, Shimonoseki, and Gensan; also one example taken in June at Chang-yang, and one taken in August in the same locality.

Distribution. AMURLAND; JAPAN; COREA; CENTRAL CHINA.

319. *Drepana curvatula.*

Bombyx curvatula, Borkh., Eur. Schmett., iii, p. 460 (1790).
Bombyx harpagula, Hübn., Bomb., pl. xi, figs. 42, 43 (1800).
Platypteryx curvatula, Kirby, Cat. Lep. Het., p. 732 (1892).
Drepana acuta, Butl., Trans. Ent. Soc., 1881, p. 596.
Platypteryx acuta, Kirby, *l. c.*, p. 733.

There were specimens from Yokohama and Oiwake in Pryer's collection. I obtained the species at Gensan in June, and have one example from Hakodate, where it was taken by a native collector in the same month. The specimen last referred to, also one from Oiwake, are pale in colour and almost exactly resemble a form of *D. falcataria*, Linn., except that the outer line of the primaries is continued on the secondaries.

Distribution. EUROPE.—AMURLAND; JAPAN; YESSO; COREA.

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320. *Drepana flavilinea.*

Drepana flavilinea, Leech, Entom., xxiii, p. 113 (1890).
Platypteryx flavilinea, Kirby, Cat. Lep. Het., p. 731 (1892).

Three specimens from Chang-yang, all taken in July.
Hab. CENTRAL CHINA.

321. *Drepana parvula.*

Drepana parvula, Leech, Entom., xxiii, p. 112 (1890).
Platypteryx parvula, Kirby, Cat. Lep. Het., p. 731 (1892).
Drepana muscula, Staud., Rom. sur Lép., vi, p. 335, pl. xii, fig. 7 (1892).

Four specimens taken by myself at Ningpo in April, and two received from Chang-yang, where they were captured in July.

Staudinger has redescribed this species from Amurland.

Distribution. NORTHERN and CENTRAL CHINA; AMURLAND.

322. *Drepana fenestra*, sp. n.

Primaries, greyish-brown, tinged with violet; with two interrupted, wavy, blackish lines before the middle, and an oblique double line from apex to inner margin; there is a small hyaline spot in the middle of the cell and a cluster of eight spots at the end of the cell; a wavy, blackish submarginal line is indicated. Secondaries have the basal area of the same colour as primaries, but the outer area is ferruginous; there is a double medial line which appears to be a continuation of the oblique one of primaries; submarginal line, wavy, blackish but not distinct. Expanse 26—30 millim.

Three specimens (2 ♂ and 1 ♀) from Wa-shan, taken in May.
Hab. WESTERN CHINA.

323. *Drepana palleolus.*

Drepanulides? palleolus, Motsch., Bull. Soc. Imp. Nat. Mosc., xxxix, p. 193 (1866).
Callidrepana palleolus, Kirby, Cat. Lep. Het., p. 730 (1892).

Occurs at Oiwake, Fujisan, Ohoyama, and Hakodate.
Hab. JAPAN and YESSO.

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324. *Drepana argenteola.*

Drepana argenteola, Moore, Lep. E.I.C., p. 369 (1859); Hampson, Fauna Brit. Ind., Moths, i, p. 338 (1892).

Drepana patrana, Moore, Proc. Zool. Soc. Lond., 1865, p. 816.

Callidrepana patrana, Kirby, Cat. Lep. Het., p. 730 (1892).

There were specimens from Nikko, Oiwake, and Fujisan in Pryer's collection, and Mr. Manley sent me an example from Yokohama. I have several specimens from Chang-yang, one from Ichang, and one from Moupin. The species is on the wing in July and August.

Distribution. SIKHIM; BURMA; CEYLON; JAVA (*Hampson*); JAPAN; CENTRAL and WESTERN CHINA.

325. *Drepana* (?) *bidens.*

Drepana bidens, Leech, Entom., xxiii, p. 113 (1890).

Platypteryx bidens, Kirby, Cat. Lep. Het., p. 731 (1892).

Described from a specimen taken at Chang-yang in July.

Hab. CENTRAL CHINA.

Genus HYPSOMADIUS.

Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 478 (1877).

326. *Hypsomadius insignis.*

Hypsomadius insignis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 479 (1877); Ill. Typ. Lep. Het., ii, p. 15, pl. xxv, fig. 3 (1878).

Type from Yokohama.

Hab. JAPAN.

Genus SPICA.

Swinhoe, Proc. Zool. Soc. Lond., 1889, p. 424.

327. *Spica parallelangula.*

Spica parallelangula, Alph., Rom. sur Lép., ix, p. 2, pl. ii, fig. 3 (1897).

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The species differs from *S. luteola*, Swinhoe, in the paler ground colour of the primaries and in the second transverse line of these wings being angulated.

It is variable in the colour of the primaries, which ranges from pale whitish ochreous to pale reddish ochreous on the one hand and to luteous-grey on the other.

Alphéraky describes this species from the province of Amdo, Central Asia. It appears to have occurred in June and July in most of the localities in Western China that my collectors visited.

Distribution. WESTERN CHINA; CENTRAL ASIA.

Genus DEROCA.

Walk., Cat. Lep. Het., iv, p. 822 (1855).

328. *Deroca inconclusa.*

Deroca inconclusa, Walk., Cat. Lep. Het., vii, p. 1727 (1856); Hampson, Fauna Brit. Ind., Moths, i, p. 344 (1892).

Deroca phasma, Butl., Ann. and Mag. Nat. Hist., (5) i, p. 442 (1871); Ill. Typ. Lep. Het., iii, p. 49, pl. liii, fig. 4 (1879).

Four specimens of each sex from Oiwake in Pryer's collection. One female example taken in June or July in the province of Kwei-chow.

In male specimens of *phasma*, Butl., the markings are much more pronounced than in typical male *inconclusa*.

Distribution. NORTH-WEST HIMALAYAS; NÁGAS; MANIPUR (*Hampson*); JAPAN; WESTERN CHINA.

329. *Deroca hyalina.*

Deroca hyalina, Walk., Cat. Lep. Het., iv, p. 823; Hampson, Fauna Brit. Ind., Moths, i, p. 344 (1892).

I have specimens from Chang-yang and Omei-shan, taken in June and July, which agree very well with examples from Kulu in my collection.

Distribution. NORTH-WEST HIMALAYAS; SIKHIM; NÁGAS; MANIPUR; EAST PEGU (*Hampson*); CENTRAL and WESTERN CHINA.

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Genus PHALACRA.

Walk., Cat. Lep. Het., xxxv, p. 1638 (1866).

330. *Phalacra vidhisara.*

Hemerophila vidhisara, Walk., Cat. Lep. Het., xxi, p. 319 (1860).
Phalacra vidhisara, Moore, Lep. Ceyl., iii, p. 541, pl. cci, figs. 1, 1a (1887); Hampson, Fauna Brit. Ind., Moths, i, p. 345 (1892).

Two female specimens from Omei-shan; July.

Distribution. BOMBAY; CALCUTTA; NILGIRIS; CEYLON (*Hampson*); WESTERN CHINA.

Genus CILIX.

Leach, Edinb. Encycl., ix, p. 134 (1815).

331. *Cilix glaucata.*

Phalæna glaucata, Scop., Ent. Carn., p. 221 (1764).
Drepana glaucata, Kirby, Cat. Lep. Het., i, p. 736 (1892).
Cilix glaucata, Hampson, Fauna Brit. Ind., Moths, i, p. 347 (1892).

I have one example taken at Chang-yang in June and Alphéraky (Rom. sur Lép., vi, p. 17) records one from Heï-hò.

Distribution. EUROPE. — NORTH AMERICA. — SIMLA; DALHOUSIE (*Hampson*); AMURLAND; CENTRAL and WESTERN CHINA.

Genus ORETA.

Walk., Cat. Lep. Het., v, p. 1166 (1855).

332. *Oreta pulchripes.*

Oreta pulchripes, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 477 (1877); Ill. Typ. Lep. Het., ii, p. 15, pl. xxv, fig. 7 (1878).
Oreta calceolaria, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 478 (1877); Ill. Typ. Lep. Het., ii, p. 15, pl. xxv fig. 4 (1878).

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A very fine and variable series from Yokohama and Oiwake in Pryer's collection. I obtained examples at Hakodate in August. *Calceolaria* is a yellow form of *O. pulchripes*, and is much commoner than the type.

I received one example of the typical form from Chia-ting-fu.

Distribution. AMURLAND; JAPAN; YESSO; WESTERN CHINA; LOOCHOO.

333. *Oreta auripes.*

Oreta auripes, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 355 (1879).

Described from Yokohama specimens.

I obtained two examples at Fushiki in July and have received one from Chang-yang, where it was taken in June.

Distribution. JAPAN; CENTRAL CHINA.

335. *Oreta calida.*

Oreta calida, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 477 (1877); Ill. Typ. Lep. Het., ii, p. 14, pl. xxv, fig. 6 (1878).

Occurs at Yokohama, Oiwake, and Hakodate.

Hab. JAPAN and YESSO.

335. *Oreta turpis.*

Oreta turpis, Butl., Ann. and Mag. Nat. Hist., (4) xx, p. 477 (1877); Ill. Typ. Lep. Het., ii, pl. xxv, fig. 8 (1878).

This was described from Yokohama. I have not seen any example of it other than the type.

Hab. JAPAN.

Genus CAMPTOCHILUS.

Hampson, Fauna Brit. Ind., Moths, i, p. 351 (1892).

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336. *Camptochilus reticulatum.*

Auzea reticulata, Moore, Lep. Atk., p. 233, pl. viii, fig. 3 (1887).

Camptochilus reticulatum, Hampson, Fauna Brit. Ind., Moths, i, p. 351 (1892).

Four specimens from Ichang and one from Chang-yang, all taken in July.

Distribution. SIKHIM: CENTRAL CHINA.

337. *Camptochilus sinuosa.*

Camptochilus sinuosa, Warren, Novit. Zool., iii, p. 342 (1896).

One example of each sex obtained in July and one male in August at Chang-yang.

Warren described this species from a female specimen taken in North Manipur.

Distribution. CENTRAL CHINA; NORTH MANIPUR.

Family THYRIDIDÆ.

Genus STRIGLINA.

Guen.; Hampson, Fauna Brit. Ind., Moths, i, p. 353 (1892).

338. *Striglina scitaria.*

Drepanodes ? scitaria, Walk., Cat. Lep. Het., xxvi, p. 1488 (1862).

Striglina scitaria, Hampson, Fauna Brit. Ind., Moths, i, p. 354 (1892).

Timandra (?) *cancellata*, Christoph, Bull. Mosc., lv, (2), p. 55 (1881).

Sonagara scitaria, Staud., Rom. sur. Lép., vi, p. 636 (1892).

A series from Yokohama in Pryer's collection; I took specimens in Satsuma in May and at Gensan in July; the

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latter agree with the Sikhim form *strigipennis*, Moore. The species has also been received from Ichang, where it was taken in June and again in August.

Distribution. FORMOSA; throughout INDIA, CEYLON and BURMA; ANDAMANS; BORNEO; NEW GUINEA; SOLOMON ISLANDS; AUSTRALIA; FIJI (*Hampson*); JAPAN; COREA; CENTRAL CHINA.

339. *Striglina vialis.*

Songara vialis, Moore, Proc. Zool. Soc. Lond., 1883, p. 27, pl. vi, fig. 9.

Striglina scitaria, Hampson, Fauna Brit. Ind., Moths, i, p. 354 (1892).

One specimen taken in July at Kiukiang; this is identical with Moore's type.

This species seems to me to be quite distinct from *S. scitaria*, although it must be admitted that the latter is very variable.

Distribution. HIMALAYAS; CENTRAL CHINA.

340. *Striglina fixseni.*

Striglina fixseni, Alph., Rom. sur Lép., ix, p. 167, pl. xi, fig. 10 ♀ (1897).

Alphéraky's types, a male and a female, were from Corea. I took a male specimen at Gensan in July.

Hab. COREA.

341. *Striglina suffusa*, sp. n.

Stramineous tinged with pink. Primaries have three pinkish transverse lines beyond the middle, the first is angulated below costa and between it and the base of the wing there are some ill-defined transverse marks. Secondaries have six or seven transverse lines but only two of these are distinct; the abdominal margin is pink. Under surface as above, but the lines on primaries are less distinct. Expanse 35 millim.

One male specimen from Chang-yang, where it was obtained in June.

Hab. CENTRAL CHINA.

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Genus SERICOPHORA.

Christoph, Bull. Mosc., lv, (2), p. 64 (1881).

342. *Sericophora guttata.*

Sericophora guttata. Christ., Bull. Mosc., lv, (2), p. 65 (1881); Staud., Rom. sur Lép., vi, p. 636, pl. xiv, fig. 14 (1892).

Siculodes ? lucidulina, Pouj., Bull. Soc. Ent. Fr., 1894, p. clxxxvi.

Three specimens taken by myself at Gensan in July; I have received examples from Chang-yang, Ichang, Moupin, Ta-chien-lu and Wa-ssu-kow, all captured in June or July.

The Gensan specimens agree with Staudinger's figure, but all the others are rather smaller in size and darker in colour, and are referable to var. *lucidulina,* Poujade.

Distribution. AMURLAND; COREA; CENTRAL and WESTERN CHINA.

343. *Sericophora* (?) *brunnea,* sp. n.

Brownish suffused and marked with darker. Primaries dotted with white on the costa, barely visible from above, and traversed by several dark brown lines; antemedial, medial, and submarginal bands dark brown, the latter rather broad, but all ill-defined. Secondaries, ochreous-brown on outer margin, with eight transverse, wavy, dark brown lines; the third and fourth and the sixth and seventh most clearly defined, and the space enclosed by each pair is brown. Under surface yellowish-orange, traversed by brown lines and bands; the apex of primaries is of the ground colour; there is a silvery white mark at the end of the cell, and there are some white dots on the costa. Expanse 25 millim.

One male from Ichang taken in June.

Hab. CENTRAL CHINA.

Genus PYRINIOIDES.

Butl., Trans. Ent. Soc. Lond., 1881, p. 199.

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344. *Pyrinioides aurea.*

Pyrinioides aurea, Butl., Trans. Ent. Soc. Lond., 1881, p. 200.

One male specimen and two females were obtained by my native collector at Hakodate in June or July, and I have received a male example from Chang-yang, taken in June, and a female from Omei-shan, taken in July.

In both Chinese specimens the transverse line of the primaries is preceded by a blotch of its own colour on the costa, and the ground colour of the Chang-yang example is pale yellowish.

Distribution. YESSO; JAPAN; CENTRAL and WESTERN CHINA.

Genus RHODONEURA.

Guen.; Hampson, Fauna Brit. Ind., Moths, i, p. 355 (1892).

345. *Rhodoneura marginepunctalis.*

Microsca marginepunctalis, Leech, Entom., xxii, p. 5, pl. iv, fig. 10 (1889).

Rhodoneura nitens (*part*), Hampson, Fauna Brit. Ind., Moths, i, p. 359 (1892).

Pharambara quadrovata, Warr., Novit. Zool., iii, p. 342.

Described from four specimens taken in Satsuma in May.

Hab. JAPAN and KIUSHIU.

346. *Rhodoneura nitens.*

Microsca nitens, Butl., Ann. and Mag. Nat. Hist., (5) xx, p. 116 (1887).

Pharambara hamifera, Moore, Lep. Atk., p. 213 (1887).

Rhodoneura nitens, Hampson, Fauna, Brit. Ind., Moths, i, p. 359 (1892).

One specimen taken by a native collector at Ningpo in July.

Distribution. NILGIRIS; CEYLON; JAPAN; SOLOMON ISLANDS (*Hampson*); NORTHERN CHINA.

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347. *Rhodoneura exusta.*

Microsca exusta, Butl., Ill. Typ. Lep. Het., iii, p. 71, pl. lviii, fig. 8 (1879).
Microsca ardens, Butl., *l. c.* fig. 9.
Microsca exusta, var. *erecta*, Leech, Entom., xxii, p. 66, pl. iv, fig. 3 (1889).
Rhodoneura exusta, Hampson, Fauna Brit. Ind., Moths, i, p. 359 (1892).

I took the type-form of this species at Nagasaki in May, at Shimonoseki, Fusan, and Gensan in June, and at Fushiki, Nagahama, and Hakodate in July; I have also received specimens from Nikko and Ichang, taken in June, and there were a number of examples from Yokohama in Pryer's collection. The *ardens* form was only met with at Hakodate, and *erecta* at Gensan, both in July.

Distribution. SIKHIM (*Hampson*); JAPAN; YESSO; COREA; CENTRAL CHINA.

348. *Rhodoneura pallida.*

Microsca pallida, Butl., Ill. Typ. Lep. Het., iii, p. 71, pl. lviii, fig. 7 (1879).
Rhodoneura pallida, Hampson, Fauna Brit. Ind., Moths, i, p. 359 (1892).

I obtained this species in Satsuma in May, at Fusan in June, and at Ningpo in July. There were specimens in Pryer's collection, and others have been received from Ichang and Chang-yang, where they were captured in July.

Distribution. SIKHIM; ASSAM (*Hampson*); JAPAN; COREA; NORTHERN and CENTRAL CHINA.

349. *Rhodoneura parallelina*, sp. n.

♂ Pale cinnamon-brown striated with dark brown. Primaries have two almost parallel blackish lines traversing the central area, the first is slightly angulated below costa, and the second is joined by a short oblique black line from costa; there is a fine, irregular black line running from the costa, shortly before apex, to middle of outer margin. Secondaries have a black, curved, antemedial line, and a fine line similar to that on outer area of primaries. Fringes dark brown.

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♀ Dark cinnamon brown; markings as in the male. Fringes ochreous brown marked with blackish, and preceded by a blackish line.

Expanse, ♂ 29 millim., ♀ 32 millim.

One male specimen from Chang-yang, and a female from Ichang, both taken in June.

Hab. CENTRAL CHINA.

Genus HYPOLAMPRUS.

Hampson, Fauna Brit. Ind., Moths, i, p. 364 (1892).

350. *Hypolamprus subrosealis.*

Microsca subrosealis, Leech, Entom., 1889, p. 5.

Two specimens from Ningpo taken by a native collector in June.

Hab. NORTH-EAST CHINA.

Genus THYRIS.

Ochs.; Walk., Cat. Lep. Het., viii, p. 72 (1856).

351. *Thyris fenestrella.*

Phalæna fenestrella, Scop., Ent. Carn., p. 217 (1763).
Sphinx pyralidiformis, Hübn., Sphing., pl. iii, fig. 16.
Thyris fenestrina, Walk., Cat. Lep. Het., viii, p. 73 (1856).

I obtained specimens at Gensan in June and July, and have received examples from Chang-yang, Wa-ssu-Kow and Ta-chien-lu taken in July. Staudinger records the species from Amurland and North China.

Distribution. EUROPE.—AMURLAND; COREA; NORTH, CENTRAL and WESTERN CHINA.

352. *Thyris usitata.*

Thyris usitata, Butl., Ann. and Mag. Nat. Hist., (5) iv, p. 367 (1879).

There were specimens from Yokohama, Oiwake, and Gifu in Pryer's collection; I took the species in Satsuma in May.

T. usitata differs from *T. fenestrella* in having only one

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hyaline spot on the primaries, and in the yellow coloration of the other spots; the ground colour is also invariably black. These characters hold good in a series of thirty-two specimens of *T. usitata* as compared with a series of thirty *T. fenestrella* from various localities.

Hab. JAPAN and KIUSHIU.

Genus HYPERTHYRIS.

Leech, Trans. Ent. Soc. Lond., 1889, p. 121.

353. *Hyperthyris aperta.*

Hyperthyris aperta, Leech, Trans. Ent. Soc. Lond., 1889, p. 122, pl. vii, fig. 7; Hampson, Fauna Brit. Ind., Moths, i, p. 370 (1892).

One male specimen from Kiukiang.

Distribution. SIKHIM (*Hampson*); CENTRAL CHINA.

SEPTEMBER 30, 1898.

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XVI. *Further notes on* Dyscritina, Westw. By E. Ernest Green, F.E.S. *With an Appendix on the species of* Dyscritina *reared by Mr. Green.* By Malcolm Burr, F.Z.S., F.E.S.

[Read March 16th, 1898.]

Plates XVIII. and XIX.

On March 18th, 1896, I had the honour of reading at a meeting of this Society, a few notes on *Dyscritina longisetosa*, Westw., in which I drew attention to the similarity of structure in this genus to that of the Forficulidæ. During the discussion that followed, it was suggested by several members that Westwood's insect was immature, and that the adult form would be winged.

Upon my return to Ceylon in January, 1897, I set myself the task of tracing out the life-history of this interesting insect. I am now able to report that I have been so far successful that, with the exception of the actual change from the egg to the young larva, I have followed the transformations of *Dyscritina* to its final stage, and witnessed the pairing of the adult insects and the subsequent oviposition.

I may here say that the above-mentioned surmises have proved to be correct, and that the adult *Dyscritina* is provided with ample wings and caudal forceps in both sexes, the general appearance of the imago being that of a typical earwig. One character that distinguishes *Dyscritina* from most other Forficulidæ is the presence in the imago of a well-developed pad (*pulvillus*) between the claws (Fig. 14), which enables the insect to run with ease over a glass surface.

Examples of the insect are not uncommon in this district (Pundaluoya). I have as yet had no opportunity of searching for it in other parts of Ceylon.

The usual habitat of the larva is beneath loose stones on the surface of the ground. I have occasionally found specimens under moss upon rocks, and under loose bark of trees. In fact it frequents much the same situations as do the common earwigs. One curious difference of

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habit is noticeable. On lifting a stone, a *Dyscritina*, when present, will usually be found back downwards, clinging to the stone itself; while other Forficulids that I have found in a similar habitat are generally seen resting on the ground beneath the stone.

Dyscritina is extremely agile, and a very difficult subject to secure. I do not recollect having met with any other insect that can run so rapidly. It simply darts across the surface of the stone and either conceals itself in some crevice on the other side, or drops to the ground and is lost beneath any rubbish that may be lying about.

The adult insect flies at night. I have taken several examples in my rooms, attracted by the lamp.

For purposes of study I find it advisable to keep the living insects confined in a somewhat small space. If allowed more ample room they conceal themselves too easily for convenience of observation. A small glass-topped cardboard box forms a convenient breeding cage, and a piece of moss-covered bark will provide sufficient shelter.

I have been unable to determine the natural food of *Dyscritina*; but it probably consists of small soft-bodied insects. In captivity both larva and imago feed sparingly upon the dead bodies of small spiders and of flies and other minute insects, showing a preference, however, for some species. They do not appear to care for lepidoptera. The common mosquito is not relished, though if *Dyscritina* is very hungry it will devour the abdomen of that insect. Bread, raw meat, petals of flowers, fruit, minute fungi, were offered, but were all refused. When food is offered to an adult *Dyscritina* it usually goes through a curious performance to test its suitability. It takes up its position to one side of and slightly in advance of the object; then bending its abdomen round to one side, it gives it a sharp nip with its forceps and retires quickly to note results. If the proffered object does not resent this treatment, it is then considered safe and fit for food; but if the victim makes any movement, *Dyscritina* immediately retires beneath its shelter.

The insects remain under cover during the day, but become very active and restless at night. When disturbed they run about with the extremity of the abdomen erected and the long caudal appendages inclined forwards.

Amongst the numerous examples obtained in this

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locality there appear to be two distinct species. Not being properly conversant with the important points of the Forficulidæ, I will not myself attempt a formal description, but content myself with noting some general characters by which the two species may be distinguished. They may be separated roughly by the structure and proportionate length of the caudal appendages in the larval stages.

In the typical form, *D. longisetosa*, the cerci are considerably longer than the body of the insect, cylindrical, multiarticulate, with many fine longish backwardly-directed hairs amongst the shorter pubescence (Figs. 4, 16).

In the new species these appendages are always shorter than the body of the insect, with comparatively few joints, tapering and with a few stout forwardly-directed spines amongst the shorter pubescence (Figs. 2, 15).

The general coloration of the two species is also different. In its larval stage *D. longisetosa* may be readily distinguished by its paler tints, the abdomen being straw-colour with brown transverse bands (Fig. 4). The larva of the new species (Fig. 2) is of a more uniform blackish-brown colour, and the femora are more distinctly banded. In both species the hinder angles of the prothorax are ornamented with well defined straw-coloured patches (Fig. 2, 4).

The imago of *D. longisetosa* varies in colour from castaneous to bright fulvous. In the darker form the prothorax bears a conspicuous blackish curved fascia on each side (Fig. 5). The paler variety usually has a diffuse brownish fascia upon the middle of the elytra.

In the new species the general tint is blackish brown. The female (Fig. 3) is more suffused with castaneous, the elytra are more conspicuously reddish.

The male insect is distinguished by the greater number of abdominal segments (Fig. 6).

On Oct. 27, 1897, a pair of this new species, reared up in captivity, were found *in coitu*. The abdomen of the male was twisted round and the extremity was closely applied to the undersurface of the pygidium of the female.

The first eggs were deposited on November 4, and others were added at intervals during the following week, until a total of twenty-five had been laid. The eggs were

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scattered singly over the exposed surface of the moss-covered bark which had been provided as a shelter for the insect, adhering slightly to their support. Towards the end of the egg-laying period a few were deposited in irregular clusters and unattached to the moss. The parent remained constantly near her eggs, visiting each one in turn, and mouthing them in a peculiar manner as if to keep them clean.

The egg is regularly elliptical; pale pinkish yellow; shining; long, 0·80 mm.; broad, 0·50 mm.

In spite of the attentions of the parent the eggs gradually shrivelled and dried up, and were eventually devoured. The female parent lived on till January 18, 1898, feeding upon small insects and drinking water greedily. This specimen was captured early in October and was then in the penultimate stage. It lived in captivity for 3½ months.

The following notes upon the development of *Dyscritina* apply to both species of the insect.

In ecdysis the skin splits along the median dorsal line of the thorax, and is shed in one complete piece, including the covering of the delicate caudal appendages. I have been unable to satisfy myself as to the total number of ecdyses undergone, the examples under observation being from a quarter to half grown at the time of capture. I have, however, observed four successive moults, the last revealing the adult insect. Each stage occupies about ten days.

With each moult, instead of a diminution in the number of joints of the caudal appendages there is a distinct progressive increase in the length of the cerci until shortly before the final ecdysis, when the appendages are abruptly curtailed, leaving nothing but the long basal joint on each side (Fig. 1). The number of joints is variable and seldom exactly the same in both cerci of any individual. The following series of measurements will demonstrate this development of the caudal appendages.

DYSCRITINA LONGISETOSA.

No. 1. *Body* 2·5 mm. long. *Cerci* of same length with 14 joints. *Antennæ* with seven joints.

No. 2. *Body* 3 mm. long. *Cerci* ⅚ mm., with 27 joints, many with incomplete divisions where fresh joints are forming. *Antennæ* with 10 joints.

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No. 3. *Body* 4·5 mm. long. *Cerci* 10 mm., with 43 joints. *Antennæ* with 8 joints on left and 9 on right side.

No. 4. *Body* 6·5 mm. long. *Cerci* incomplete, apparently injured (within them the cerci of the next stage are plainly visible and it is noticeable that the joints of the two sets do not correspond). *Antennæ*, left with 14, right with 12 joints.

No. 5. *Body* 7·75 mm. long. *Cerci* 13·5 mm., with 45 joints.

No. 6. The penultimate stage.—*Body* 9 mm. long. *Cerci* 1 mm. *Antennæ* with 14 joints.

The length of the adult insect varies from 11·50 to 16 mm. of which the forceps occupy from 1 to 1·25 mm.

In the larva of the new species there is a corresponding increase in the number of joints of the cerci during growth; though in this case it is more gradual and less noticeable as the total number of joints is much smaller, the fully grown larva having only from 18 to 20 joints in these appendages. Their total length is only about three quarters that of the body of the insect.

As stated above, in the penultimate stage the cerci are abruptly curtailed to a single joint. These basal joints retain their previous character, and bear no resemblance to the forceps of the perfect insect. They are quite straight, with irregularly truncate extremities, looking as if the subsequent joints had been broken or bitten off. And I believe that such is really the case. No cast skin has been observed to accompany this change, and in one instance the insect lost the appendage on one side twenty-four hours before the opposite one disappeared. The superfluous parts are probably eaten off by the insect itself. Upon examination of the abbreviated caudal appendages by transmitted light, the future forceps of the adult insect can be plainly seen within them (Fig. 11).

From the above facts it would appear probable that the single jointed cercus (forceps) of the larval *Forficulidæ* is not formed by a fusion of smaller joints, but corresponds with the long basal joints of the larval appendages of *Dyscritina*.

Towards the end of the larval period the notal plates of the metathorax are distinctly sculptured with a radiating pattern, resembling in miniature a Forficulid wing (Figs. 2, 4).

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The glandular folds of the (3rd and 4th ?) dorsal plates of the abdomen commence to appear when the larva is about half grown. Fig. 10 is taken from an example with a body length of 4·50 mm.

Another character is noticeable in all stages—from the young larva to the adult insect. Towards the undersurface of each antennal joint can be distinguished an oval glandular (?) body (Figs. 12, 13), indicated on the surface by a shallow depression and a minute pore. I suppose these to be sense organs of some kind. Can they be of the nature of auditory organs?

Upon the terminal joint of each of the palpi is a minute tactile organ consisting of a small fleshy tubercle bearing a number of minute points at its extremity (Fig. 7).

Throughout the larval period the feet are destitute of any pad between the claws, and the second tarsal joint is minute and fused with the first. In the adult insect the three tarsal joints become distinct, and there is a conspicuous cup-shaped pulvillus between the claws of each foot (Fig. 14).

The coriaceous tips of the folded wings of the imago project to a distance equal to about half the length of the elytra. The wing itself is ample (Fig. 6) and longer than the body of the insect. The membranous area is not entirely concealed when the wing is closed, several short folds appearing outside the coriaceous part.

The number of antennal joints in the imago is variable. One example shows 16 joints on one side and 15 on the other. Another has 13 and 16 respectively. A third example has 16 and 17; a fourth carries 15 joints only. I am inclined to consider 16 as the normal number.

I was able to observe one imago shortly after its emergence. All the parts of the insect were soft and colourless; but the wings were accurately folded in their proper position.

In the penultimate stage the femora of the first pair of legs are broad and are armed on the inner edge with a row of spines (Fig. 1) which gives them a distinctly raptorial appearance: but I have never seen them used either to catch or hold their prey. On the other hand I have watched one of these insects feeding upon and dragging about a fly without using its forelimbs for any other purpose than locomotion.

From the above general particulars the following

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characters may perhaps be selected as distinctive of the genus *Dyscritina*.

Larva with many-jointed caudal appendages.

Adult with single jointed appendages in the form of forceps. Wings as in *Forficula*. Feet with pulvillus between claws. Number of antennal joints variable (normally 16 ?).

A glandular pore on each antennal joint in all stages of the insect.

ON THE SPECIES OF *DYSCRITINA* REARED BY MR. GREEN.

By Malcolm Burr, F.Z.S., F.E.S.

The great interest and importance of Mr. E. E. Green's paper is twofold. First, it settles definitely the vexed question of the affinities of *Dyscritina longisetosa*, Westw., and to a great extent elucidates the economy of earwigs, about which little has been known, especially with regard to tropical species. Secondly, the facts disclosed throw much light on a more general question, the origin of the Forficulidæ and their phylogenetic relationship to other insects, particularly among the Orthoptera.

An examination of the imagos which Mr. Green has bred from the *Dyscritina* form at once shows that they are to be referred to the genus *Diplatys*, Serv., to which *Cylindrogaster*, Stål, is nearly allied.

These two genera are separated by Kirby in his synoptical table by the presence on the third and fourth abdominal segments in *Diplatys* of pliciform tubercles, which are absent from *Cylindrogaster*. Both genera are represented in the tropical part of the New World as well as in Africa and Asia.

The surprising point shown by Mr. Green's investigations lies not so much in fact that the mysterious larva has developed into an earwig, for that was to a certain extent foretold by most entomologists who examined the immature specimens, but rather in the manner in which the caudal setæ develop into forceps.

That the forceps of earwigs are the homologues of the cerci of true Orthoptera is now obvious, but their manner of development, in the species before us at least, is

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remarkable. I have seen immature specimens of allied genera in various stages of growth, but know of no case which presents an analogous development.

There still remain two insufficiently described creatures, at present assigned to the Forficulidæ, whose true position is doubtful but may be determined in time, as has been that of *Dyscritina longisetosa*. One of these is *Condylopalama agilis*, Sund., taken at Stockholm in timber imported from Brazil, which Mr. Kirby suggests may be *Iapyx*. The other doubtful species is *Typhlolabia larva* (Phil.), which possibly is not an earwig.

It is not yet clear to what group earwigs are most nearly allied; but it seems to me that earwigs and cockroaches are offshoots of a common stock. Some exotic cockroaches present an arrangment of the wings which is analogous with the folding of the wings of earwigs, and the development and general habits of the two groups are almost identical. A wingless earwig with jointed cerci would resemble a small wingless cockroach to a very marked extent. It is not meant to advance this theory as a definite view but rather to throw it out as a suggestion.

It was altogether unexpected that two species should be derived from the old *Dyscritina longisetosa*. Early last summer Mr. Green kindly sent me, among a lot of earwigs, an adult *D. longisetosa*; but at that time neither of us suspected that it was the imago of this curious larva, and I then regarded it as a new species of *Cylindrogaster*, Stål. As Mr. Green's two species are to be referred to the genus *Diplatys*, Serv., the first will be *Diplatys longisetosa* (Westw.); the other I regard as identical with *Diplatys nigriceps* (Kirby) from which it differs only in minor details of coloration. *D. nigriceps* (Kirby) is already known from Hong-Kong and Bombay, but *D. longisetosa*, so far as I know, has never been taken outside Ceylon.

As the latter species has not been described in the imago stage, I append a description, and to make things complete add a further description of *D. nigriceps* (Kirby).

Diplatys longisetosa (Westw.).

LARVA. *Dyscritina longisetosa*, Westwood, Trans. Ent. Soc. Lond., 1881, p. 601, pl. xxii, fig. 1; Green, *op. cit.*, 1896, p. 229.

Colore testacea. Caput pronoto latius: pronotum subquadratum margine postico rotundato. Elytra et alae perfecte explicatae, longae,

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illa apice oblique rotundata, hae valde prominentes. Pedes testacei. Abdominis segmenta 3 et 4 tuberculis pliciformibus instructa; segmentum ultimum magnum; forcipum crura brevia, recta, conica.

Long. corporis 10·5–14·75 millim.; long. forcipum 1–1·25 millim.

Head flattened, reddish, slightly broader than the pronotum; antennae testaceous; eyes black; mouth parts testaceous. Pronotum reddish, squared, the hinder margin rounded, the disc somewhat raised anteriorly, flattened posteriorly. Elytra long and broad, pale testaceous, the disc darker; broader near the base, considerably narrower at the apex, where they are obliquely rounded; scutellum visible at the base of the elytra, very small. Wings ample, projecting well beyond the elytra, the coriaceous portion testaceous on inner margin, darker on outer margin. Legs uniform testaceous. Abdomen cylindrical, reddish, basal half of the segments paler; tubercles of the 3rd and 4th segments indistinct; apical segment large, dark reddish, with a very faint median longitudinal sulcus, the posterior border produced into a small tubercle at each angle. Branches of the forceps stout, straight, short and conical, not quite contiguous, furnished each at the base on the upper side with a small sensory (?) foramen.

The hinder part of the head, the pronotum, the basal and apical parts of the elytra, the wings, femora and tibiae clothed with a few long bristles; dorsal aspect of the abdomen and the tarsi with a dense pale pubescence.

Hab. CEYLON, Punduluoya (*Green*).

Judging by the descriptions this species appears to be smaller and redder than its allies.

Diplatys nigriceps (Kirby).

Cylindrogaster nigriceps, Kirby, Linn. Soc. Journ. Zool., xxiii, p. 507 (1890).

Colore fuscus. Caput rotundatum, pronoto latius. Pronotum deplanatum, margine postico rotundato. Elytra et alae perfecte explicatæ, longæ, illa apice oblique rotundata. Pedes fusci, tibiis pallidioribus. Abdomen gracile, segmento ultimo magno.

♂. Abdomen medio paullo constrictum, forcipum crura brevia, basi subcontigua, valida, dehinc attenuata, recta, in parte apicali graciliora, inermia, apice ipso incurva, vix decussata.

♀. Abdomen cylindricum, minus gracile, forcipum crura inter

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se distantia, basi validiora, dehinc attenuata, recta, inermia, apice attingentia.

Long. corporis 10 millim.; long. forcipum 1·4 millim.

Head blackish, rounded, slightly rounded between the eyes, broader than the pronotum; eyes black, antennæ black, palpi testaceous. Pronotum blackish, flattened, hinder margin rounded. Elytra long and broad, dark brown, slightly paler in the female than in the male. Wings creamy, the coriaceous part blackish, shorter than in *D. longisetosa*. Legs, femora blackish, tibiæ paler, blackish at the base, tarsi paler. Abdomen black, the tubercles of the 3rd and 4th segments less distinct in the male than in the female; in the male long and slender, subconstricted in the middle, the last segment large, its median sulcus very faint. Forceps black ♂, reddish ♀.

Hab. HONG-KONG (*Kirby, Mus. Brit.*); INDIA, Bombay, (*Mus. Brit.*); CEYLON, Punduluoya (*Green*).

The pubescence and hairs of this species are arranged as in the last, but are less dense and strongly marked.

The specimens reared by Mr. Green differ slightly from the type form in colour. In the type form the pronotum is broadly bordered with white posteriorly, whereas it is uniform blackish in Mr. Green's examples. This difference, which is not enough to justify the establishment of a separate species, is the only distinction which I could find upon comparing Mr. Green's insects with Mr. Kirby's type.

PLATES XVIII. AND XIX.

[*See Explanations facing the* PLATES].

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XVII. *The Larva of* Eriocephala allionella. By Thomas Algernon Chapman, M.D., F.E.S.

[Read April 6th, 1898.]

At the end of March, 1897, I met with *Eriocephala allionella* near Cannes, and by imprisoning several of the females with damp moss, I succeeded in obtaining eggs in the same way as I had done in the case of *Eriocephala calthella*. In due time these eggs hatched, but though a few of the larvæ appeared to have eaten a little, as evidenced by some coloration of their intestinal contents, nothing further came of the experiment. This was, however, due rather to my travelling about at the time and giving them no fair chance, than to the want of a proper species of moss; which may, however, have been the effective cause of failure. I preserved one specimen of the larva tolerably successfully, and from this example and my recollections of them alive, the remainder having been sacrificed in the attempt to rear them, I am able to give some account of it. Briefly, this account might be reduced to a statement that the larva does not differ to any appreciable extent from that of *calthella*. It is somewhat larger and less flimsy in consequence, and perhaps whiter in colour.

The eggs are a little larger than those of *E. calthella*, but I have not the exact measurement; they are similarly clothed with a snowy exudation of white filaments.

The larva is about 0·95 mm. in length and of the same truncate angular outlines as that of *calthella*. The antennæ are similarly very long, and the true legs and eight pairs of false legs have the same structure, relation and size as in *calthella*. There is an error in my description of the larva of *calthella*, which was first called attention to by Professor H. G. Dyar, to whom I sent specimens; this is as to the number of rows of ball-like appendages. On the first seven abdominal segments, there are ten rows of them and not eight, as stated in my description (Trans. Ent. Soc. Lond. 1894, p. 342). They occur in double rows, a double row on each side of the dorsum, and a double row on each lateral region, and a double row again on each side below

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this, the upper members of the last-mentioned double row being balls like the others, the lower forming the series of false feet. That is, if the false feet are taken to be representative of the balls, there are twelve rows, ten of balls and two of feet, only that the two rows of feet do not form a double row of themselves but appear to be the inferior members of the double row of which the lower series of ball appendages is the other. The reason for taking the appendages thus in double rows is that there is a greater distance from one double row to the next, than between the two rows of which it consists. The first thoracic segment has two rows transversely, four in the first and three in the second on either side. The second and third thoracic segments have the two upper pairs of rows on either side as in the following segments, but on each segment the lower row just above the feet has two appendages, one in front of the other.

The eighth abdominal segment has one appendage in this row, but above this it has two transverse rows of two on either side; the ninth segment has three on either side, and the tenth carries the two setæ, which appear to be homologous with cerci rather than with any ordinary tubercles or processes of lepidopterous larvæ. The larva appears also to have a sucker similar to that of *E. calthella*, but I did not happen to see it obviously used by the living larva.

I have not been able as yet to get larvæ of *Panorpa*, but Brauer's account of the larva and especially of the disposition of the tubercles and of the abdominal legs shows that the resemblance between the larvæ of *Panorpa* and *Eriocephala* is very close.

The idea that the bristles on the last abdominal segment are cerci is one requiring fuller investigation; but I fail to imagine what else they can be. It seems impossible to correlate them with any of the ordinary appendages of lepidopterous larvæ, since they are the only bristle-like appendages and are quite different from the ball appendages that probably represent the usual tubercles. It is to be remembered that, though I call them bristles, they are of very large size (for bristles) in comparison with the size of the larva itself, and I do not know what their structure is.

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XVIII. *A list of the* Clavicorn Coleoptera *of St. Vincent Grenada, and the Grenadines.* By G. C. Champion, F.Z.S.

[Read October 5th, 1898.]

The Clavicorn Coleoptera collected by Mr. H. H. Smith in St. Vincent, Grenada, and the Grenadines, under the auspices of the Royal Society and the British Association, have been partially worked out by M. A. Grouvelle of Paris. He has already published descriptions of two genera and seventeen species, [Notes from the Leyden Museum, xx. pp. 35—48 (1898)], and it is proposed here to give a complete list of the insects named by him. These belong to the families Nitidulidæ, Trogositidæ, Colydiidæ, Rhysodidæ, Cucujidæ, Cryptophagidæ, Monotomidæ, Mycetophagidæ, Dermestidæ, Byrrhidæ, and Parnidæ. The two new genera appertain to the last-mentioned family. The Silphidæ, Phalacridæ, and Scaphidiidæ, and some few species of Cryptophagidæ, Latridiidæ, Byrrhidæ, and Dermestidæ, have still to be dealt with. The Trichopterygidæ, and some of the Corylophidæ, have been described or noticed by the late A. Matthews [Ann. and Mag. Nat. Hist. (6) xiii. pp. 334—342, (1894)]. A list of the Histeridæ has been furnished by Mr. G. Lewis. It may be noted that M. Grouvelle in his paper (*loc. cit.* p. 35) has by some inadvertence stated that the specimens belong to the Cambridge Museum: this is quite a mistake, the collections being really the property of the West India Committee, who hand them over to the British Museum as soon as they are worked out. The new species that have been described from Mr. Smith's captures are marked with an asterisk.

Fam. HISTERIDÆ.

Phelister, Mars.

Phelister hæmorrhous.

Phelister hæmorrhous, Mars., Monogr. Hist., p. 476, t. 14, fig. 9 (1853); Lewis, Biol. Centr.-Am., Col. ii, 1, p. 185.

Hab. St. Vincent—Leeward side; Grenada—Balthazar (Windward side), Mount Gay Estate (Leeward side).

Sixteen specimens.

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Phelister rouzeti.

Paromalus rouzeti, Fairm., Ann. Soc. Ent. Fr., 1849, p. 421.

Phelister rouzeti, Mars., Monogr. Hist., p. 488, t. 14, fig. 20 (1853); Lewis, Biol. Centr.-Am., Col. ii, 1, p. 193.

Hab. St. Vincent—Leeward side, &c.
Four specimens.

HISTER, Linn.

Hister confinis.

Hister confinis, Er. in Klug's Jahrb., 1834, p. 15; Mars., Monogr. Hist., p. 250, t. 7, fig. 58 (1854).

Hab. St. Vincent—Windward side; Grenada—Balthazar (Windward side), Mount Gay Estate (Leeward side).
Six specimens.

*Hister planiformis.**

Hister planiformis, Lewis, Ann. and Mag. Nat. Hist. (6) xx, p. 359 (1897).

Hab. Grenada—Mount Gay Estate.
One specimen.

PAROMALUS, Er.

Paromalus hispaniolæ.

Paromalus hispaniolæ, Mars., Ann. Soc. Ent. Belg., xiii, p. 101 (1870).

Hab. St. Vincent—Leeward side and South end; Grenada—Balthazar (Windward side).
Six specimens. Described from Cuba.

CARCINOPS, Mars.

Carcinops troglodytes.

Hister troglodytes, Payk., Monogr. Hist., p. 46, t. 10, fig. 1.

Carcinops troglodytes, Mars., Monogr. Hist., p. 92, t. 8, no. 22, fig. 5 (1855).

Hab. St. Vincent—Windward side; Grenada—Balthazar, Soubise (Windwards ide), Mount Gay Estate (Leeward side).
Fifteen specimens.

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SAPRINUS, Er.

Saprinus æneicollis.

Saprinus æneicollis, Mars., Monogr. Hist., p. 424, t. 17, fig. 56 (1855); Lewis, Biol. Centr.-Am., Col. ii, 1, p. 223.

Hab. St. Vincent—Windward side, &c.
Five specimens.

Saprinus apricarius.

Saprinus apricarius, Er. in Klug's Jahrb., 1834, p. 194; Mars., Monogr. Hist., p. 725, t. 20, no. 38, fig. 158 (1855).

Hab. St. Vincent.
One specimen.

ACRITUS, Lec.

Six or seven very obscure species of this genus were obtained by Mr. H. H. Smith in Grenada or St. Vincent, but they are mostly represented by one or two specimens only, and Mr. Lewis has not ventured to name them.

Fam. NITIDULIDÆ.

BRACHYPTERUS, Kugel.

*Brachypterus insularis.**

Brachypterus insularis, Grouv., Notes Leyd. Mus., xx, p. 35.

Hab. Grenada—Mount Gay Estate (Leeward side).
One specimen.

COLASTUS, Er.

Colastus ruptus.

Nitidula rupta, Fabr., Syst. Eleuth., i, p. 354.
Colastus ruptus, Er. in Germ. Zeitschr., iv, p. 237; Murr., Monogr. Nitid., p. 258, t. 34, fig 1.

Hab. St. Vincent—Windward and Leeward sides; Grenada—Balthazar and Chantilly Estate (Windward side).
Found in abundance in St. Vincent.

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Colastus triangularis.

Colastus triangularis, Murr., Monogr. Nitid., p. 282.

Hab. St. Vincent—Leeward side; Grenada—Balthazar, Chantilly Estate, Soubise (Windward side), St. George's, Mount Gay Estate (Leeward side).

BRACHYPEPLUS, Er.

Brachypeplus anceps.

Brachypeplus anceps, Murr., Monogr. Nitid., p. 297.

Hab. St. Vincent—Leeward and Windward sides; Grenada—Chantilly Estate, Balthazar (Windward side), Mt. Maitland (Leeward side).

Sent in plenty from St. Vincent.

Brachypeplus mutilatus.

Brachypeplus mutilatus, Er. in Germ. Zeitschr., iv, p. 246.

Hab. Grenada—St. George's (Leeward side).

One specimen.

Brachypeplus tenuis?

Brachypeplus tenuis, Murr., Monogr. Nitid., p. 298.

Hab. St. Vincent.

Nine specimens. Labelled by M. Grouvelle as possibly referable to this species.

MACROSTOLA, Murr.

Macrostola lutea.

Macrostola lutea, Murr., Monogr. Nitid., p. 333.

Hab. St. Vincent—Leeward side.

One specimen.

CONOTELUS, Germ.

Conotelus conicus.

Stenus conicus, Fabr., Syst. Eleuth., ii, p. 603.

Conotelus conicus, Murr., Monogr. Nitid., p. 334; Lacord., Gen. Col., Atlas, t. 18, fig. 2.

Hab. St. Vincent—South end, Windward and Leeward sides; Grenadines—Mustique I., Becquia I.

Sent in abundance from each of these localities, but apparently not met with in Grenada.

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Conotelus stenoides.

Conotelus stenoides, Murr., Monogr. Nitid., p. 338; Sharp, Biol. Centr.-Am., Col. ii, 1, p. 283, t. 9, fig 7.
Hab. St. Vincent—Leeward side.
Three specimens.

CARPOPHILUS, Steph.

Carpophilus hemipterus.

Dermestes hemipterus, Linn., Syst. Nat., ed. xii, i, 2, p. 565.
Carpophilus hemipterus, Murr., Monogr, Nitid., p. 362, t. 32, fig. 10; Sharp, Biol. Centr.-Am., Col., ii, 1, p. 287.

Hab. St. Vincent—Leeward side; Grenada—Balthazar, Soubise, Chantilly Estate (Windward side).
Found in profusion in St. Vincent.

Carpophilus dimidiatus.

Nitidula dimidiata, Fabr., Ent. Syst., i, p. 261.
Carpophilus dimidiatus, Murr., Monogr. Nitid., p. 379.

Hab. Grenada—Balthazar (Windward side), St. George's (Leeward side).
Two specimens.

Carpophilus mutilatus.

Carpophilus mutilatus, Er. in Germ Zeitschr., iv, p. 258; Murr., Monogr. Nitid., p. 378.

Hab. Grenada—Mount Gay Estate (Leeward side).
One specimen.

HAPTONCUS, Murr.

Haptoncus luteola.

Epuræa luteola, Er. in Germ. Zeitschr., iv, p. 272.
Haptoncus pauperculus, Reitt., Verh. Ver. Brünn, 1873, p. 179.

Hab. St. Vincent—Windward and Leeward sides; Grenada—Balthazar, Chantilly Estate (Windward side), St. John's River, Mount Gay Estate, St. George's (Leeward side).
Found in abundance in both islands.

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STELIDOTA, Er.

Stelidota strigosa.

Nitidula strigosa, Gyll. in Schönherr's, Syn. Ins., ii, p. 140.
Stelidota strigosa, Er. in Germ. Zeitschr., iv, p. 302; Sharp, Biol. Centr.-Am., Col. ii, 1, p. 310.

Hab. St. Vincent—Leeward and Windward sides, Kingstown; Grenada—Balthazar and Chantilly Estate (Windward side), Mt. Maitland, Mount Gay Estate, St. George's and Grand Etang Rd. (Leeward side); Grenadines—Becquia I.

Sent in plenty from St. Vincent and Grenada.

Stelidota geminata.

Nitidula geminata, Say, Journ. Acad. Phil., v, p. 181.
Stelidota geminata, Er. in Germ. Zeitschr., iv, p. 302; Sharp, Biol. Centr.-Am., Col. ii, 1, p. 312.

Hab. St. Vincent—Windward and Leeward sides, Kingstown; Grenada—Balthazar and Chantilly Estate (Windward side), Mt. Maitland and Mount Gay Estate (Leeward side), Windsor.

Found commonly in both islands.

Stelidota championi?

Stelidota championi, Sharp, Biol. Centr.-Am., Col. ii, 1, p. 315, t. 10, fig. 6.

Hab. St. Vincent—Leeward and Windward sides, Kingstown; Grenada—Lake Antoine Estate, Balthazar, Soubise (Windward side), Mount Gay Estate, St. George's, Grand Etang Rd., St. John's River (Leeward side), Woburn (South end); Grenadines—Mustique I.

Found in abundance everywhere in these islands. The specimens are labelled by M. Grouvelle as being referable to *S. championi* or possibly to *S. chontalensis*, Sharp. He has separated as a variety several examples with a well-defined black patch on each elytron.

Stelidota chontalensis.

Stelidota chontalensis, Sharp, Biol. Centr.-Am., Col. ii, 1, p. 314.

Hab. St. Vincent—Windward side.

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LOBIOPA, Er.

Lobiopa decumana.

Lobiopa decumana, Er. in Germ. Zeitschr., iv, p. 295; Sharp, Biol. Centr.-Am., Col. ii, 1, p, 321.

Hab. St. Vincent—Windward and Leeward sides; Grenada—Balthazar (Windward side), Grand Etang Rd., Mount Gay Estate (Leeward side); Grenadines—Becquia I.

Found in plenty in both Grenada and St. Vincent.

CAMPTODES, Er.

Camptodes sp.

Hab. St. Vincent.

Three specimens, returned unnamed by M Grouvelle.

PALLODES, Er.

*Pallodes cyanescens.**

Pallodes cyanescens, Grouv., Notes Leyd. Mus., xx, p. 36.

Hab. St. Vincent—Leeward side, &c.

Twenty specimens.

Pallodes ruficollis?

Pallodes ruficollis, Reitt., Verh. Ver. Brünn, xii, p. 135.

Hab. St. Vincent—Leeward and Windward sides.

Found in profusion in St. Vincent. Labelled by M. Grouvelle as probably referable to *P. ruficollis*, Reitt. The type was from Cuba.

*Pallodes smithi.**

Pallodes smithi, Grouv., Notes Leyd. Mus., xx, p. 35.

Hab. Grenada—Black Forest and Chantilly Estates (Windward side), Mt. Maitland (Leeward side).

Nine specimens.

Fam. TROGOSITIDÆ.

TENEBROIDES, Piller and Mitterp.

Tenebroides steinheili?

Tenebrioides steinheili, Reitt., Deutsche ent. Zeitschr., 1875, p. 75.

Hab. Grenadines—Mustique I.

One specimen, perhaps belonging to this species.

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TEMNOCHILA, Westw.

Temnochila ebenina, Blanch., Voy. d'Orb., Col., p. 205, t. 19, fig. 7.

Hab. Grenadines—Mustique I.

One specimen.

LOPHOCATERES, Olliff.

Lophocateres pusillus.

Peltis pusilla, Klug, Ins. Madag., p. 71.

Hab. St. Vincent—Windward side.

One specimen. Originally described from Madagascar.

Fam.. COLYDIIDÆ.

DITOMA, Illig.

Ditoma quadricollis.

Ditoma quadricollis, Horn, Trans. Am. Ent. Soc., xii, p 149.

Hab.. St. Vincent—South end.

Four specimens.

LEMNIS, Pasc.

*Lemnis denticulatus.**

Lemnis denticulatus, Grouv., Notes Leyd. Mus., xx, p. 39.

Hab. St. Vincent—Leeward side; Grenada—Balthazar and Chantilly Estate (Windward side).

Eight specimens, seven of which are from Grenada.

SYNCHITA, Hellw.

Synchita laticollis.

Synchita laticollis, Lec., New Sp. Col., p. 66 (1863).

Hab. St. Vincent—South end, Leeward side; Grenada—Balthazar, Grand Etang, Black Forest Estate (Windward side), Mount Gay Estate (Leeward side).

Numerous specimens from both islands.

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CATOLÆMUS, Sharp.

*Catolæmus exilis.**

Catolæmus exilis, Grouv., Notes Leyd. Mus., xx, p. 38.

Hab. St. Vincent—Leeward side; Grenada—Mount Gay Estate, St. George's, Grand Etang Rd. (Leeward side).

Seven specimens, all but one from Grenada.

MICROSICUS, Sharp.

*Microsicus minimus.**

Microsicus minimus, Grouv., Notes Leyd. Mus., xx, p. 37.

Hab. Grenada—Balthazar, Chantilly Estate (Windward side), Mount Gay Estate (Leeward side).

Four specimens.

NEOTRICHUS, Sharp.

*Neotrichus insularis.**

Neotrichus insularis, Grouv., Notes Leyd. Mus., xx, p. 38.

Hab. St. Vincent—Leeward and Windward sides; Grenada—Balthazar (Windward side).

Found in abundance in St. Vincent, singly in Grenada.

PENTHELISPA, Pasc.

Penthelispa sp.

Hab. St. Vincent—Leeward side.

One specimen, probably belonging to an undescribed species.

PYCNOMERUS, Er.

Pycnomerus exaratus.

Cerylon exaratum, Chevr., Ann. Soc. Ent. Fr., 1863, p. 610.

Hab. St. Vincent; Grenada—Black Forest Estate (Windward side).

Many specimens from both islands. Recorded from Cuba, Puerto Rico, and Guadaloupe.

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BOTHRIDERES, Er.

Bothrideres dentatus.

Bothrideres dentatus, Chevr., Ann. Soc. Ent. Fr., 1863, p. 609.

Hab. St. Vincent.

One specimen. Occurs in Cuba.

SOSYLUS, Er.

Sosylus costipennis.

Nematidium costipenne, Jacq. Duv. in Sagra's Hist. fis. polit. y nat. de Cuba, Ins., p. 103, t. 9, fig. 15.

Hab. Grenada—Balthazar (Windward side).

One specimen. Labelled by M. Grouvelle as identical with the Cuban type.

NEMATIDIUM, Er.

Nematidium filiforme?

Nematidium filiforme, Lec., New Sp. Col., p. 68 (1863), (*nec* Pasc.).

Hab. Grenada—Balthazar (Windward side).

Two specimens. Labelled by M. Grouvelle as *N. filiforme*, Lec., or a very closely allied species.

CERYLON, Latr.

Cerylon amaroides.

Cerylon amaroides, Chevr., Ann. Soc. Ent. Fr., 1863, p. 610.

Hab. Grenada—St. George's (Leeward side).

One specimen. Recorded from Cuba.

LYTOPEPLUS, Sharp.

*Lytopeplus insularis.**

Lytopeplus insularis, Grouv., Notes Leyd. Mus., xx, p. 40.

Hab. St. Vincent—Leeward side.

One specimen.

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PHILOTHERMUS, Aubé.

Philothermus puberulus.

Philothermus puberulus, Schwarz, Proc. Am. Phil. Soc., xvii, p. 361 ; Sharp, Biol. Centr.-Am., Col. ii, 1, p. 493.

Hab. St. Vincent—Leeward side; Grenada—Black Forest Estate (Windward side).

Ten specimens.

Fam. RHYSODIDÆ.

Clinidium guildingi.

Clinidium guildingii, Kirby, Zool. Journ., v, p. 8, t. 2, figg. 1–4; Chevr., Ann. Soc. Ent. Fr., 1863, p. 611.

Rhysodes guildingii, Newm., Mag. Nat. Hist. (2), ii, p. 667.

Rhysodes planus, Chevr. in Guérin's Icon. Règne Anim., Ins., iii, p. 58.

Hab. St. Vincent—Leeward and Windward sides.

Thirteen specimens. Recorded from St. Vincent, Guadaloupe and Cuba.

Fam. CUCUJIDÆ.

INOPEPLUS, Smith.

Inopeplus præustus.

Ino præusta, Chevr., Rev. Zool., 1858, p. 212; Lacord., Gen. Col., Atlas, t. 21, fig. 2.

Hab. St. Vincent—Leeward side.

One specimen. Also found in Guadaloupe.

*Inopeplus insularis.**

Inopeplus insularis, Grouv., Notes Leyd. Mus., xx, p. 41.

Hab. Grenada—Mount Gay Estate, St. John's River, St. George's (Leeward side), Grand Etang Rd., Balthazar, Chantilly Estate (Windward side); Grenadines—Mustique I.

Seventeen specimens.

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TELEPHANUS Er.

Telephanus terminatus.

Telephanus terminatus, Grouv., Ann. Soc. Ent. Fr., 1880, p. 175, t. 5, fig. 11; 1889, p. 161.

Hab. St. Vincent—Leeward and Windward sides, Kingstown.

Sixteen examples.

Telephanus sp.?

Hab. St. Vincent—Leeward and Windward sides, Kingstown; Grenada—Balthazar and Chantilly Estate (Windward side).

Fifteen examples. Labelled by M. Grouvelle as very near his *T. elongatus*.

Telephanus paradoxus.

Telephanus paradoxus, Reitt., Verh. zool.-bot. Ges. Wien, xxiv, p. 524; Grouv., Ann. Soc. Ent. Fr., 1880, p. 175, t. 5, fig. 12, and 1889, p. 160.

Hab. Grenada—Balthazar (Windward side).

One specimen.

LÆMOPHLŒUS, Steph.

Læmophlœus nitens.

Læmophlœus nitens, Lec., Proc. Acad. Phil., 1854, p. 75.

Hab. Grenada—Soubise (Windward side).

One specimen.

Læmophlœus pusillus.

Cucujus pusillus, Schönh., Syn. Ins., i, 3, p. 55.

Læmophlœus pusillus, Er., Naturg. Ins. Deutschl., iii, p. 321.

Hab. St. Vincent—Leeward side; Grenada—St. George's (Leeward side).

Five specimens.

Læmophlœus pallentipennis.

Læmophlœus pallentipennis, Grouv., Ann. Soc. Ent. Fr., 1876, p. 500, t. 9, fig. 20.

Hab. St. Vincent—Windward side, Kingstown; Grenada—Balthazar (Windward side).

Eight specimens. The types were from Central America.

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Læmophlœus castancipennis.

Læmophlœus castaneipennis, Grouv., Ann. Soc. Ent. Fr., 1876, p. 494, t. 8, fig. 12.

Hab. Grenada—Balthazar (Windward side), St. George's (Leeward side).

Eleven specimens.

*Læmophlœus caseyi.**

Læmophlœus caseyi, Grouv., Notes Leyd. Mus., xx, p. 42.

Hab. Grenada—Grand Etang Rd. (Leeward side).

One specimen.

*Læmophlœus smithi.**

Læmophlœus smithi, Grouv., Notes Leyd. Mus., xx, p. 41.

Hab. Grenada—Mount Gay Estate (Leeward side).

One specimen.

MICROBRONTES, Reitt.

Microbrontes uncicornis.

Microbrontes uncicornis, Reitt., Col. Hefte, xv, p. 45.

Læmophlœus uncicornis, Grouv., Ann. Soc. Ent. Fr., 1876, p. 502, t. 9, fig. 23.

Hab. St. Vincent—South end; Grenada—Mount Gay Estate, St. George's, St. John's River (Leeward side), Woburn (South end): Grenadines—Mustique I.

Found in plenty in Grenada and Mustique. Recorded from Cuba, Martinique, Puerto Rico, Mexico, and Brazil.

CRYPTAMORPHA, Woll.

Cryptamorpha musæ.

Cryptamorpha musæ, Woll., Ins. Mader., p. 157, t. 4, fig. 1.

Hab. St. Vincent—Leeward side; Grenada—Balthazar (Windward side).

Three specimens.

SILVANUS.

Silvanus unidentatus.

Ips unidentatus, Oliv., Ent., ii, no. 18, p. 12, t. 1, fig. 4.

Silvanus unidentatus, Er., Naturg. Ins. Deutschl., iii, p. 338.

Hab. Grenada—Soubise (Windward side).

Two specimens.

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Silvanus triangulus.

Silvanus triangulus, Reitt., Col. Hefte, xv, p. 60.

Hab. St. Vincent—Leeward side; Grenada—Mount Gay Estate and St. John's River (Leeward side).

The type was from Japan. M. Grouvelle notes that this species had not previously been recorded from America, and that it has recently been found by M. Fauvel in Madeira.

Silvanus fasciatus.

Silvanus signatus, Frauenf., Verh. zool.-bot. ges. Wien, xvii, p. 438, t. 121, fig. 28 (1867).

Cathartus fascipennis, Reitt., Col. Hefte, xv, p. 129 (1876).

Hab. St. Vincent—Leeward side; Grenada—Vendome and Mount Gay Estates, St. John's River, St. George's (Leeward side), Balthazar, Soubise, Chantilly and Telescope Estates (Windward side); Grenadines—Mustique I.

Found in plenty in Grenada. Frauenfeld's type of this species was found on board the Austrian ship "Novara," near Shanghai.

Silvanus trivialis.

Silvanus trivialis, Grouv., Ann. Soc. Ent. Fr., 1878, p. 75, t. 2, fig. 13.

Hab. St. Vincent—Windward side; Grenada—Balthazar, Soubise (Windward side), Mount Gay Estate (Leeward side).

Twelve examples.

CATHARTUS, Reiche.

Cathartus quadricollis.

Silvanus quadricollis, Guér., Icon Règne Anim., Ins., iii, p. 198.

Cathartus quadricollis, Reitt., Col. Hefte, xv, p. 128.

Hab. St. Vincent—Leeward side; Grenada—Balthazar, Chantilly Estate, Soubise (Windward side), St. George's, St. John's River, Mount Gay Estate, Grand Etang Rd. (Leeward side), Woburn (South end); Grenadines—Mustique I.

Found in profusion everywhere.

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Cathartus advena.

Cryptophagus advena, Waltl, Faunus, i, p. 169.
Silvanus advena, Er., Naturg. Ins. Deutschl., iii, p. 339.
Cathartus advena, Reitt., Col. Hefte, xv, p. 127.
Hab. Grenada—Chantilly Estate and Balthazar (Windward side).
Two specimens.

Cathartus cassiæ.

Cathartus cassiæ, Reiche, Ann. Soc. Ent. Fr., 1854, p. 78; Reitt., Col. Hefte, xv, p. 126.
Hab. St. Vincent—Leeward side; Grenada—Balthazar (Windward side).
Three specimens. Recorded from Cuba.

Cathartus angulicollis.

Cathartus angulicollis, Reitt., Verh. zool.-bot. Ges. Wien, xxviii, p. 194.
Hab. Grenada—Balthazar (Windward side).
Four examples.

Cathartus gemellatus.

Sylvanus gemellatus, Jacq. Duv. in Sagra's Hist. fis. polit. y nat. de Cuba, Ins., p. 104.
Hab. Grenada—Balthazar (Windward side).
Eight specimens.

NAUSIBIUS, Redt.

Nausibius clavicornis.

Cucujus clavicornis, Kugel., Neuest. Mag. Ent., p. 571.
Corticaria dentata, Marsh., Ent. Brit., p. 108.
Hab. St. Vincent—Leeward side.
Two specimens.

Fam. CRYPTOPHAGIDÆ.

CRYPTOPHILUS, Reitt.

*Cryptophilus frater.**

Cryptophilus frater, Grouv., Notes Leyd. Mus., xx, p. 43.
Hab. Grenada—Soubise (Windward side), Mount Gay Estate (Leeward side).
Twelve specimens

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LOBERUS, Lec.

Loberus testaceus.

Loberus testaceus, Reitt., Deutsche ent. Zeitschr., 1875, p. 77.

Hab. St. Vincent—Windward and Leeward sides, Kingstown; Grenada — Lake Antoine Estate (Windward side); Grenadines—Becquia I.

Numerous examples from Grenada and St. Vincent. The type was from St. Thomas.

Loberus discipennis.

Loberus discipennis, Reitt., Deutsche ent. Zeitschr., 1875, p. 76.

Hab. St. Vincent—Leeward side and South end; Grenada — Woodford and Mount Gay Estates, Grand Etang Rd., St. George's (Leeward side), Mirabeau and Chantilly Estates, Balthazar (Windward side).

Found in plenty in both islands. The type was from Teapa, Mexico.

Fam. MONOTOMIDÆ.

MONOTOMA, Herbst.

Monotoma picipes.

Monotoma picipes, Herbst, Käfer, V, p. 24, t. 46, fig. 2; Horn, Trans. Am. Ent. Soc., vii, p. 259.

Monotoma foveata, Lec., Proc. Acad. Phil., 1855, p. 305.

Hab. St. Vincent—Leeward side; Grenada—Balthazar (Windward side).

Two specimens.

Monotoma spinicollis.

Monotoma spinicollis, Aubé, Ann. Soc. Ent. Fr., 1837, p. 463, t. 17, fig. 6.

Hab. St. Vincent—Leeward side; Grenada—Mount Gay Estate (Leeward side).

Two specimens.

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Monotoma americana.

Monotoma americana, Aubé, Ann. Soc. Ent. Fr., 1837, p. 461, t. 17, fig. 5; Horn, Trans. Am. Ent. Soc., vii, p. 260.

Hab. St. Vincent—Leeward side; Grenada—Mount Gay Estate and Grand Etang Rd. (Leeward side), Soubise (Windward side), Woburn (South end).

Found in abundance in Grenada, one specimen only from St. Vincent.

Monotoma parellela?

Monotoma parellela, Lec., Proc. Acad. Phil., 1855, p. 305; Horn, Trans. Am. Ent. Soc., vii., p. 260.

Hab. Grenada—Balthazar (Windward side), Mount Gay Estate (Leeward side).

Named by M. Grouvelle as probably *M. parallela*, Lec. Numerous examples.

EUROPS, Woll.

Europs sp.

Hab. St. Vincent—Leeward and Windward sides; Grenada—Balthazar (Windward side).

Sixteen specimens. Labelled by M. Grouvelle as very near *E. rhizophagoides*, Reitt.

Europs lineellus?

Europs lineellus, Reitt., Verh. Ver. Brünn., xi, p. 42.

Hab. St. Vincent; Grenada—Balthazar (Windward side).

Three specimens, referred by M. Grouvelle with some doubt to this species.

Europs maculatus.

Europs maculatus, Grouv., Ann. Soc. Ent. Fr., 1876, p. 210.

Hab. St. Vincent.

One specimen, labelled by M. Grouvelle as a variety? of this species.

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BACTRIDIUM, Lec.

Bactridium sp.

Hab. St. Vincent—South end ; Grenada—Mount Gay Estate, St. John's River (Leeward side).

Ten specimens. Labelled by M. Grouvelle as very near *B. adustum*, Reitt.

TISIPHONE, Reitt.

Tisiphone exilis.

Cercus exilis, Murr., Monogr. Nitid., p. 238.

Tisiphone nitiduloides, Reitt., Deutsche ent. Zeitschr., 1876, p. 301.

Hab. St. Vincent—Leeward side; Grenada—Mount Gay Estate (Leeward side), Chantilly Estate, Balthazar (Windward side).

Found in plenty in Grenada. M. Grouvelle notes that Reitter's insect agrees with a type of *Cercus exilis*, Murr., in the collection of Mr. A. Fry.

Fam. MYCETOPHAGIDÆ.

TYPHÆA, Steph.

Typhœa fumata.

Dermestes fumatus, Linn., Syst. Nat., ed. xii, i, 2, p. 564.

Typhœa fumata, Steph., Illustr. Brit. Ent., Mand., iii, p. 71.

Hab. St. Vincent—Leeward and Windward sides; Grenada—Mount Gay Estate (Leeward side), Balthazar (Windward side).

Found in plenty in both islands.

LITARGUS, Er.

Litargus sp.

Hab. St. Vincent—Leeward and Windward sides; Grenada—Grand Etang, Balthazar (Windward side), Grand Etang Rd. (Leeward side).

Seven specimens. Labelled by M. Grouvelle as very near *L. balteatus*. Lec.

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DIPLOCŒLUS, Guér.

*Diplocœlus similis.**

Diplocœlus (*Marginus*) *similis*, Grouv., Notes Leyd. Mus., xx, p. 44.

Hab. Grenada—Mount Gay Estate, St. George's (Leeward side).

Eighteen specimens.

Fam. DERMESTIDÆ.

DERMESTES, Linn.

Dermestes carnivorus?

Dermestes carnivorus, Fabr., Syst. Ent., p. 55.

Hab. Grenada—Mount Gay Estate (Leeward side).

Three specimens. Labelled by M. Grouvelle as probably *D. carnivorus*, Fabr.

Fam. BYRRHIDÆ.

NOSODENDRON, Latr.

Nosodendron cribratum.

Cercyon cribratum, Cast., Hist. Nat. Ins., ii, p. 62.

Hab. St. Vincent.

Twelve specimens. The type was from Guadaloupe.

Fam. PARNIDÆ.

PSEPHENOPS.

Psephenops, Grouv., Notes Leyd. Mus., xx, p. 44.

*Psephenops smithi.**

Psephenops smithi, Grouv., *loc. cit.*, p. 45.

Hab. St. Vincent; Grenada—Mt. Maitland (Leeward side), Chantilly Estate (Windward side).

Four specimens, two from each island.†

† An allied form was found by myself in Guatemala. This insect was incorrectly placed with the Dascillidæ when the Central-American collections were sorted, and for this reason was omitted by Dr. Sharp in his published enumeration of the Parnidæ of that region.

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XEXANCHORINUS.

Xexanchorinus, Grouv., Notes Leyd. Mus., xx, p. 45.

*Xexanchorinus latus.**

Xexanchorinus latus, Grouv., *loc. cit.*, p. 46.

Hab. Grenada—Chantilly Estate (Windward side).
Three specimens.

PHANOCERUS, Sharp.

*Phanocerus congener.**

Phanocerus congener, Grouv., Notes Leyd. Mus., xx, p. 46.

Hab. Grenada—Balthazar (Windward side).
Three specimens.

ELMIS, Latr.

*Elmis smithi.**

Helmis smithi, Grouv., Notes Leyd. Mus., xx, p. 47.

Hab. Grenada—Mount Gay Estate, St. John's River, St. George's (Leeward side).
Found in abundance by Mr. H. H. Smith.

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XIX. *Notes on some Syrphidæ collected near Aden by Colonel J. W. Yerbury in February and March, 1895.* By George Henry Verrall, F.E.S.

[Read October 5th, 1898.]

Some very interesting species of *Syrphidæ* were collected near Aden by Col. J. W. Yerbury in the early part of 1895, and although he has succeeded in identifying almost all of them, he has asked me to publish an account of them.

There are fifteen species in the collection, and I shall as far as possible use Col. Yerbury's own notes, which I place in inverted commas.

1. *Paragus serratus*, Fabr.

"Very common throughout the neighbourhood—in Ceylon too it may be considered the commonest and most generally distributed Syrphid found in the island."

This species varies considerably in coloration, like most species of *Paragus*. Col. Yerbury's nine specimens are all males, some of which have blackish markings on the disc of the third abdominal segment, and also have the hindmargin of the fourth segment broadly black, as well as all the genitalia. The middle black line down the face is sometimes not very distinct. The grey lines on the front part of the thorax distinctly diverge.

2. *Paragus longiventris*.

Loew, Dipt. Sud.-Afr., p. 295.

"Uncommon; only three specimens, Lahej and Haithalhim, March, 1895."

This species is easily distinguished by the shape of its abdomen. Loew described it from Kaffraria, and therefore it probably occurs on all the East African coast. The pubescence on the eyes is so slight that it is not easily detected, but the microscopical pubescence on the wings extends over the whole of the wings, except on the basal cells.

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3. *Syrphus adligatus.*

Wied., Auss.-eur. Zweifl., ii, p. 122.

I am of opinion that a single female taken by Col. Yerbury may belong to this species, rather than to "*S. claripennis*? Loew, etc.," as suggested by him, though he also suggested a comparison with *S. adligatus*. Identifications from a single specimen, especially when a female, cannot be conclusive in such groups as this. The specimen was captured at Aden, February 23, 1895.

4. *Syrphus ægyptius.*

"*Syrphus ægyptius*, Wied., Auss.-eur. Zweifl., ii, p. 133.

? *Scæva scutellaris*, Fabr., Syst. Antl., p. 252, 15.

? *Syrphus splendens*, Dolesch., Nat. Tijd. Ned. Ind., x, p. 410, pl. i, fig. 3.

? *Syrphus javanus*, Wied., *op. cit.*, ii, p. 131.

Very common. Can this species be kept distinct from *S. scutellaris* (Fabr.)? Specimens from Ceylon and India appear to be nearer to *ægyptius* than to *scutellaris*. Wiedemann's type was from Egypt,—Fabricius's from Tranquebar, not Mogador as erroneously stated by Loew (Dipt. Sud.-Afr., p. 303). It is a common species in Ceylon and also in the Deccan (neighbourhood of Poonah and Mahableshwar?), though the specimens from this locality are not properly labelled."

I see no objection to sinking *S. ægyptius* under *S. scutellaris*. It is very divergent from the European species of *Syrphus*, and tends towards *Sphærophoria*. The species is very variable, as the basal abdominal band is often entire, even in the female, though in that sex the abdominal bands are narrower and much more sharply defined. I doubt whether *S. javanus* is a synonym, but I think that *S. splendens* is only a variety with dark rings on the hind femora and tibiæ.

5. *Asarcina salviæ*, Fabr.

"*Scæva salviæ*, Fabr.

? *Syrphus ericetorum*, Fabr., Spec. Ins., ii, p. 425.

One specimen from Aden.

There seems considerable doubt as to the name under which this species should stand—*ericetorum* appears to have priority, and though Fabricius (Syst. Antl., p. 250)

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sinks the name '*Syrphus ericetorum*' in favour of '*Scæva salviæ*,' still the question arises whether the matter was not out of his hands, and whether, having described the insect, he was not bound to abide by his first description. This is a common species throughout the Oriental Region."

The old description of *S. ericetorum* is unrecognisable.

6. *Baccha sapphirina.*

"*Baccha sapphirina*, Wied., Auss.-eur. Zweifl., ii, p. 96.

Very common in the neighbourhood of Aden, this species occurs also in Ceylon (rare) and the Bombay Presidency (Deccan?) where it appears to be uncommon."

7. *Eristalis æneus*, Scop., var. *taphicus.*

"*Eristalis taphicus*, Wied., Auss.-eur. Zweifl., ii, p. 191.

Very common."

When examining various type collections of Diptera in 1896, I came to the conclusion that I could not consider *E. taphicus* as anything but a tropical form of *E. æneus*, and the specimens taken by Col. Yerbury strongly confirm me in that opinion; some of his males would pass for true *E. æneus*, and I possess European and even British females which might be considered almost *E. taphicus*.

8. *Eristalis tæniops.*

"*Eristalis tæniops*, Wied., Zool. Mag., xi, p. 42.
Eristalis torridus, Walk., List Dipt. B.M., p. 612.
Eristalis ægyptius, Walk., List Dipt. B.M., p. 621.

A single specimen Aden, 23.2.95."

9. *Eristalis quinquelineatus.*

"*Eristalis quinquelineatus*, Fabr., Spec. Ins., ii, p. 425, 21.
? *Eristalis punctifer*, Walk., Ent., v, p. 274.
? *Eristalis tabanoides*, Jaennicke, Abh. Senckenb. Ges., vi, p. 402.

Rather uncommon, found sitting on the wet mud

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(where the water has splashed over) round the wells and water casks at the tanks. Walker records *E. punctifer* from Tajurra."

I believe that Col. Yerbury has correctly identified this species, but I had hitherto considered *E. punctifer*, Walk., as a doubtful synonym of *E. tæniops*.

10. *Simoides crassipes.*

"*Eristalis crassipes*, Fabr., Syst. Antl., p. 237, 22.
Simoides crassipes, Loew, Dipt. Sud.-Afr., p. 322.

Only one specimen taken at Lahej, 7.3.95. This species was seen flying round the flowers of *Terminalia catappa* in company with the bee *Apis indica*; it was extremely difficult to distinguish the two insects apart when on the wing."

This case of mimicry is very interesting.

11. *Helophilus africanus*, sp. n.

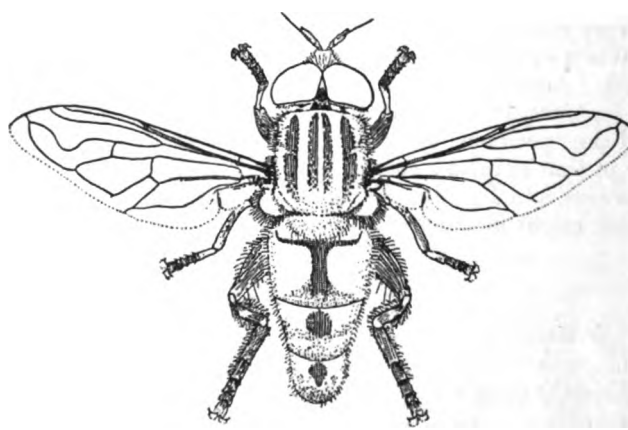

Fig. 1. *Helophilus africanus*, sp. n., ♂.

Oculi maris contigui; thorax niger, vittis quinque flavis; abdomen ochraceum opacum, macula nigra in segmento secundo T-formi, in segmentis tertio et quarto rotundatis; pedes nigri, genubus, tibis anterioribus annuloque in tibiis posticis obscure ochraceis; femora omnia crassa, postica inferius apud apicem scabra; tibiæ omnes villosæ; tarsi postici in basi extremâ pilorum globuliferorum fasciculo praediti.

Long. corp. circa 13 millm.

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♂. Face yellow, with an ill-defined median black line ; it is almost perpendicular from the antennæ to the upper mouth edge. The face and frons are clothed with rather abundant yellow pubescence ; the back of the head bears longer paler pubescence below ; the vertex is black about the ocelli, but greyish-yellow in front, and bears short black pubescence. Eyes touching for a small space. Antennæ dull blackish, basal joints sometimes dull reddish ; arista yellowish-brown.

Thorax black with five distinct yellow lines, the middle line being quite distinct though rather narrower than the others.

Abdomen reddish-ochreous ("rothlichochergelb" of Loew), dull ; the second segment has the base narrowly, and an incomplete wider dorsal line, blackish ; the third and fourth segments bear an almost circular blackish dorsal spot near the base ; all the hindmargins of the segments show obscure signs of darkening ; genitalia brown, rather shining.

Legs dull black, with the tips of the femora dull ochreous and more extensively so behind the hind femora ; the anterior tibiæ are all dull obscure ochreous ; while the hind tibiæ have the base and a rather broad middle ring obscurely ochreous, and the two basal joints of the middle tarsi and the base of the front tarsi are similarly coloured. All the femora are thick, the middle pair being least so and the hind pair most so ; the hind femora are not serrulate beneath, but bear black bristly hairs and a scabrous patch near the tip composed of short black bristles, while there is the usual scabrous black patch at the base in front ; all the femora bear abundant soft yellow pubescence. Tibiæ all with abundant soft pubescence, mainly yellow but mixed with black ; hind tibiæ dilated and curved, bearing long shaggy black pubescence beneath. Tarsi all dilated, at any rate towards the tip, the hind pair bearing rather long shaggy black pubescence in front, and also bearing at the base beneath the peculiar knob-headed black hairs, which peculiar hairs can be traced, though very short, over all the sole of the basal joint.

Wings slightly tinged with brown, dullish. Squamæ and halteres orange.

♀. Similar but with shorter pubescence ; frons narrow for a female, all brownish-yellow except on the shining bare space just above the antennæ, its pubescence being all yellow except just about the ocelli. Abdomen less sharply marked, all the hindmargins being greyish glaucous, while the round black spot on the fourth segment has a tendency to spread out into two sloping darkened lines, of which there is some indication on the third segment ; the fifth segment is mainly ochreous yellow with an ill-defined shining black space about the middle of the hindmargin. Legs much paler, the

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femora ranging from dull brownish-black with a paler tip to being all dull ochreous except a blackish streak above the anterior pairs on the apical half, or sometimes the basal half of the hind femora blackish ; the hind tibiæ have only obscure blackish patches before and after the middle ; pubescence mostly short and inconspicuous, but there are some scattered thin hairs beneath the hind femora, and there is a neat fringe beneath the hind tibiæ, besides which the short black bristles beneath the hind femora form a large irregularly crowded clump between the middle and the tip ; the knob-headed hairs beneath the basal joint of the kind tarsi are almost as distinct as in the male.

"*Helophilus* sp. nov ? near *H. senegalensis*, Macq., Dipt. exot., ii, p. 61.

Not uncommon in the bed of the stream at Haithalhim." Three males and five females.

I am prepared to go further than Col. Yerbury, and to say that I think that the species is *H. senegalensis*, but as the insect described by Macquart could be identified only by a reference to the type, which is not in Bigot's collection, I prefer to give a name and description which I hope may serve for identification.

This species is very near *H. caffer*, Loew, but it has the middle yellow line on the thorax far more distinct, and also has different abdominal markings. In all probability it is one of a group of closely allied African species which would come under Rondani's genus *Mesembrius*, in which the eyes of the male touch and of which one species only, *H. peregrinus*, Loew, is known to occur in Europe. There are many species closely allied to *H. trivittatus* in Europe and North America, and in Arctic regions there is a group circling round *H. borealis*.

12. *Syritta latitarsata*.

Syritta latitarsata, Macq., Dipt. exot., ii, p. 75.

Colonel Yerbury's notes ("*Syritta abyssinica* ? Rondani, Ann. Mus. Genov., iv, p. 282 ; fairly common at Lahej and Haithalhim") merely suggest that this and the next species, which he also refers to, may be *S. abyssinica* of Rondani. I cannot agree with this, but I believe that the little-known *S. latitarsata* of Macquart is clearly represented by three males and four females among Col. Yerbury's captures.

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A detailed description of this species may be of value, as the species of *Syritta* are so very closely allied and so insufficiently distinguished.

FIG. 2. *Syritta latitarsata*, right hind leg, from behind.

S. latitarsata. About the size of *S. pipiens*, but the abdomen is narrower and longer. Face, frons, and all the vertex except about the ocelli glossed with silvery white tomentum ; face and frons without pubescence except for a few white hairs down the sides of the face ; the sides of the mouth and the very small jowls are yellowish ; the back of the head is narrow and is whitish, and bare until the top where there is a pale fringe behind the eyes and vertex ; vertex shining black about the ocellar triangle but otherwise glossed with silvery white ; it is all bare except for whitish pubescence on the elongated front part. Eyes touching for about six facets and consequently the vertex is about three times as long as the frons ; the facets on this front part where the eyes touch are considerably dilated. Antennæ entirely pale orange, without any hairs or bristles on the basal joints ; the third joint is nearly twice as long as deep ; arista placed at about a third from the base, brownish-yellow, and about as long as the antennæ.

Thorax dull blackish, densely punctate, with whitish reflections ; humeri whitish with a faint yellow tinge ; a large space behind the humeri, spreading almost across the suture and over all the pleuræ whitish and also a pair of tolerably broad short lines on the front part of the disc of the thorax ; the disc of the thorax is practically bare, as the pubescence, which consists of minute appressed whitish hairs, is hardly visible, but the upper part of the pleuræ and the adjoining parts of the thorax bear a slight whitish pubescence. Scutellum black, densely punctate, disc flattened and slightly marginate at the tip, practically bare as the bristles are so short.

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Abdomen longer than the head (without antennæ), thorax and scutellum together, and constricted about the second and third segments; the second and third segments are almost all yellow, but the second segment has a black dorsal line and hindmargin, while the third segment has only a black hindmargin (except the extreme margin which is whitish), and a slightly darkened dorsal line; the fourth segment widens out and is mostly shining blackish and bearing tiny black bristles; the sides of the first segment and the basal corners of the fourth segment are yellowish; the end of the fourth segment is dark brownish-red, but the extreme hindmargin is whitish; the sides of the second segment bear at the base the usual remarkable fringe of white hairs, and all the other pubescence is very short and inconspicuous. Genitalia shining dark brownish-red, and bearing very soft whitish pubescence.

Legs mainly dark orange on the anterior pairs, but black on the hind pair; anterior coxæ blackish, glossed with whitish grey; middle femora slightly darkened beneath, and with a short fine whitish ciliation behind; hind legs nearly all shining black, but the coxæ are glossed with whitish dust, and the legs are dark reddish on the trochanters, the extreme base of the femora, a band just after the middle of the femora which is scarcely extended to the upper side, the extreme base and a tolerably obvious band just after the middle of the tibiæ; beyond which the tips of the tibiæ and the base of the tarsi are indistinctly red, and in fact the tibiæ are altogether slightly tinged with reddish; the hind coxæ bear a slight whitish pubescence beneath; the hind femora are considerably dilated on the apical half, and bear two rows of spines besides the short serration beneath, there being about eight regular spines behind and about five in front on this thick apical half; hind tibiæ much curved; *tarsi widely flattened*, even to the tip.

Wings very pellucid; pale yellow about the base, the subcostal cell, and the stigma. Squamæ whitish with white fringes. Halteres pale orange.

♀. Face and frons whitish; vertex shining black; frons rather narrow on the upper part, and often with an indefinite rubbed dark crossband just above the middle, and it bears inconspicuous short white pubescence; the facets on the front of the eyes are not dilated. Abdomen broader than in the male and not constricted; the sides of the first segment are whitish-yellow, the second and third segments bear at the basal corners large yellowish triangular spots which leave little more black than a broad hindmargin and a less defined dorsal line, and on the third segment a narrow grey hindmargin; the fourth segment is more brownish, with small whitish-grey spots at the basal corners, and with a whitish-grey

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hindmargin. Legs similar to those of the male, but the reddish markings on the hind femora are often more extensive and more conspicuous; the spines on the hind femora are similar but shorter and rather less numerous; hind tarsi dilated, but not nearly so conspicuously as in the male.

Length about 8·5 millm.

S. abyssinica, if a good species, has probably blacker hind legs, a not yellow stigma, and not dilated hind tarsi. *S. bulbus*, Walk., from Sierra Leone might be compared.

13. *Syritta fasciata.*

Syritta fasciata, Wied., Auss.-eur. Zweifl., ii, p. 103.

This may be represented by two males and one female taken at Haithalhim on March 30th, 1895. The specimens represent a small species which seems to agree with Wiedemann's description of what must be the female, though Wiedemann does not mention any sex. The species may be worthy of a description as minute as I have given of *S. latitarsata*, but as the material is weak and the identification less certain, I will only say that the female specimen answers well to his description, but that the frons is whitish, with the vertex and a cross-band above the middle black; in the males the spots on the second and third segments of the abdomen are much larger, and occupy all those segments except a dorsal line and the hindmargin, while in one male the spots actually join on the foremargin of the third segment. The abdomen of the male is but slightly constricted, the third segment being the narrowest; the fourth segment is black, rather shining, and rather long, with a small whitish spot at each basal corner, and with a brownish-yellow hindmargin. The legs of the male may be less black than in the female, as although the legs of the one female taken by Col. Yerbury would almost agree with Wiedemann's description of being almost all black, yet one male has the usual orange band about the middle of the hind femora, and the other male has the basal two-thirds or more of the hind femora orange.

Some of the best characters to distinguish this species must be its small size, orange antennæ, yellow face, and comparatively unarmed hind femora.

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14. *Eumerus lunatus.*

"*Syrphus lunatus*? Fabr., Ent. Syst., iv, p. 296, 64.

Rare, only three specimens taken. It sits on the stems of *Salvadora persica* and is difficult to catch, as it keeps in the thick of the bush."

The specimens are all males, and, I think, correctly named. Wiedemann has redescribed the species (Auss.-eur. Zweifl., ii, p. 111).

15. *Eumerus obliquus.*

"*Syrphus obliquus*, Fabr., Syst. Antl., p. 194, 28.

Rare; three specimens taken in Aden, 15.2.95."

This species has been redescribed by Wiedemann (Auss.-eur. Zweifl. ii, p. 112) and again by Loew (Dipt. Süd-Afrik.), wherein Loew accidentally in his diagnosis says "*fronte nigro-pilosa*" instead of *albo-pilosa.*

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XX. *On some Oriental Scolytidæ of economic importance, with Descriptions of five new Species.* By WALTER F. H. BLANDFORD, M.A., F.Z.S.

[Read November 2nd, 1898.]

FROM time to time I have received for determination small consignments of Asiatic Scolytids, sent as being injurious to, or more generally associated with a diseased condition of, trees, &c., of economic value.

Such material is usually difficult to deal with. Too often such a consignment contains but a few specimens, among which may be examples of species, either new or of a most obscure character. Rarely does one receive a good series of specimens in proper preservation.

To discuss each sending separately is merely to multiply short papers and single descriptions, unfortunately all too common in economic entomology. In this paper I propose to deal with an accumulation of such consignments which have been in my hands for some time. The source of each, and the particulars furnished therewith, are first given, and the specimens sent are identified so far as possible. The species which I regard as new are afterwards described.

N.W. PROVINCES. "In bark of dead *Pinus excelsa*—Jaunsar and Deoban" (*Ind. Mus.*).

The specimens sent with the above note belong to the genera *Polygraphus* and *Pityogenes*. I am uncertain whether one or two species of *Polygraphus* are represented; as no Oriental species of the genus has been described, the form or forms sent are likely to be new. All the species are so closely allied, that it is useless to attempt any determination without an exhaustive study of good series of all available forms. The single example of *Pityogenes* is an example of a black species allied to *P. chalcographus* and unknown to me; it is not *P. scitus*, Blandf. The material is, however, insufficient for a description.

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E. HIMALAYAS. "Taken from stem of a young India-rubber twig, *Ficus elastica*—Tieta Valley, 1,100 ft., 30th July, 1897" (*E. P. Stebbing*).

One new species, described under the name *Diamerus fici*.

CHITTAGONG. "Destructive to Mahogany-trees in the Chittagong Hill Tracts" (*Ind. Mus.*).

Monsieur P. Lesne, of the Paris Museum, has forwarded me examples of two species received by him among Bostrychidæ from the Indian Museum, Calcutta, with the above description of their habits. They belong to two very interesting new forms, described under the names of *Scolytoplatypus brahma* and *Xyleborus gravidus*.

CEYLON. The following specimens have been forwarded to me by Mr. E. Ernest Green:—

(*a*). "Species injurious to ebony seed."

Numerous examples, which I am inclined to refer to *Coccotrypes integer*, Eichh., originally described from Siam. I have not seen the type, but have made a comparison of the specimens with a typical example of *C. pygmæus*, Eichh., which Eichhoff very carefully differentiates from *C. integer*. The habit of seed-boring is common to the genus, and *C. dactyliperda* constantly attracts notice in the East as a date-borer.

(*b*). Species supposed to cause disease to Cocoa-trees (*Theobroma cacao*). Mr. Green writes of these:—"Stems of the diseased trees were submitted to me, and I found the enclosed specimens either in the rotting bark or in the wood itself. It was the smallest species, with smooth elytra, that seemed to tunnel deepest. But I gave it as my opinion that the beetles were not the cause of the disease, but were attracted by the altered sap and dying wood. I thought the real cause was either some fungoid disease or unsuitable soil. The whole sap of the tree was altered and turned sour, whereas the tunnels of the beetles were very small and widely separated."

Examples of four species were received: (1) a *Crossotarsus*, which I take to be *C. saundersi*, Chap., although it differs slightly from the type in the direction of *C. fairmairei*, Chap.—probably both forms are races of one and the same species; (2) *Xyleborus semigranosus*, Blandf., previously described by me (Trans. Ent. Soc. Lond., 1896, p. 211) from the refuse of imported Sumatra tobacco;

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(3) *Xyleborus fornicatus*, Eichh., recorded by me (*loc. cit.*, p. 214) as injurious to the tea-plant in Ceylon, and again referred to below; (4) *Eccoptopterus sex-spinosus*, Motsch., previously recorded as injurious to the rice-plant in Burma.

I imagine that *X. fornicatus* is the "smallest species, with smooth elytra."

(*c*). Further examples from Cocoa-trees. Mr. Green writes: "I was of opinion that the beetles [consignment *b*] were not primarily responsible for the injury, and this opinion has been corroborated by the discovery of a fungus in all the diseased specimens of bark submitted to Kew.

"I am now forwarding two more species of Scolytid beetles that are found in the younger *branches* of the Cocoa-tree, which really are injurious to the plant. They form their tunnels in what appears to be healthy wood and rapidly cause the death of the parts attacked. A dark chocolate or purplish stain spreads through the tissues of the wood surrounding the galleries of the insect."

The two species are both new, and are described under the names of *Xyleborus mancus* and *X. discolor*.

PENANG. "Species injurious to Nutmeg-trees."

Mr. C. O. Waterhouse has received and has communicated to me examples of three species. The majority belong to *Phlœosinus cribratus*, Blandf. (Trans. Ent. Soc. Lond., 1896, p. 198), first described from the refuse of Sumatra tobacco; they vary considerably in length (2–3·4 millim.), but not otherwise except that in some, presumably males, the apices of the 1st and 3rd elytral interstices are not tuberculate.

Besides these, there is an individual which appears to belong to a distinct species of *Phlœosinus*, and is left undetermined; there are also examples of *Xyleborus fornicatus*.

Descriptions follow of the species, five in number, sent in these various consignments, which appear to be new and recognisable.

Scolytoplatypus brahma, sp. n.

♀. *S. mikado* ♀, Blandf., forma adeo similis, elytris tamen proportione brevioribus prothorace solum tertia parte superantibus.

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Opaca, densissime minute reticulata, nigro-picea, fronte supra os, elytrorum apice, pedibus, ventro plus minusve dilutioribus ; prothoracis disco conferte strigoso-punctato, poro medio oblongo ; elytris obsoletissime substriatis, punctis omnino nullis, interstitiis 1°, 3°, 5° in declivitate minute tuberculatis. Long. 3 millim.

Fem. Similar in form to *S. mikado* ♀, but with the elytra relatively shorter, not more than one-third longer than the prothorax. Blackish-pitchy, dull, entirely covered with fine and extremely dense alutaceous reticulation. Front minutely punctate, with a transverse subnitid impression over the mouth, the space between it and the black epistoma brown-testaceous ; antennæ brown-testaceous, the club infuscate, obovate-acuminate. Prothorax with the lateral and hind angles prominent and acute, median pore not large, oblong, surface with very close confluent longitudinal strigose punctures, not deep. Elytra scarcely bisinuate at the base, lighter along the suture and at the apex, closely shagreened, with traces of striæ, the punctures of which are not discernible, interstices from behind the middle with a faint median raised line, the 1st, 3rd, and 5th on the declivity with a series of minute tubercles ; declivity convex, with short erect yellowish pubescence. Underside piceous, lighter in places, with coarse shallow punctuation ; anterior legs piceo-ferruginous, the middle and posterior legs brown-testaceous.

Hab. INDIA, Chittagong Hills.

While the sculpture is most like that of *S. eutomoides*, Blandf., it is quite peculiar. That of the elytra, though very weak, is complex in character, and is consequently difficult to describe adequately. The species belongs to my subgenus *Tæniocerus*.

Diamerus fici, sp. n.

Oblongus, niger, opacus, capite subnitido, dense punctato, prothorace antice constricto, conferte punctato ; elytris post basin prothorace adeo latioribus, ad apicem haud productis, crenato-striatis, interstitiis subconvexis, sat subtiliter multipunctatis et brevissime setosis. Long. 5·5 millim.

Oblong, black, subopaque, the antennæ and tarsi piceous brown. Head slightly shining, closely but not very strongly punctate, and furnished with very short accumbent grey pubescence, front impressed between the antennal foveæ, convex above and with a slight median nodular elevation, somewhat more shining ; eyes oblong-oval ; antennal club flattened, obovate, somewhat blunt at apex, very closely pubescent, with a strongly angulate suture towards the base. Prothorax not strongly transverse, constricted anteriorly, the

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sides rounded, lateral margins distinct but not prominent from the base to the middle, dorsum convex, with very close but not coarse punctuation, and a subcarinate median line from the base to the middle, base impressed for the elytra. Scutellum indistinguishable. Elytra twice as long as the prothorax, separately and strongly rounded at base with narrow raised crenate margins carried back obliquely and sinuate at the sides over the metasternum, the sides sinuate but subparallel, obliquely inflexed at the apex, which forms an angle at the suture but is not produced ; surface with moderately deep incised shining crenate striæ, the interstices subconvex, with close and rather fine punctures bearing very short and inconspicuous setæ. Underside strongly punctured, and pubescent with short grey hairs. Legs robust, the anterior tibiæ widened apically, their upper border crenate, the upper apical angle with a backwardly-directed tooth ; middle and posterior tibiæ with the upper border rounded and crenate.

Hab. E. HIMALAYAS, Tieta Valley, 1,100 ft. (*E. P. Stebbing*).

The species has all the appearance of a *Hylesinus*, from which the structure of the antennal club separates it. Compared with *D. curvifer*, Walk., the nearest allied species known to me, it differs in the absence of the complete opacity characteristic of that species, in the much closer thoracic punctuation, less deeply incised elytral striæ and more convex interstices, as well as in the non-mucronate elytral apex. Assuming the species to be correctly assigned to *Diamerus*, and I do not see any reason for separating it, one must infer that *Diamerus* and *Hylesinus* are somewhat nearly allied to each other.

Xyleborus gravidus, sp. n.

♀. Curta, robusta, rufo-testacea, elytris præcipue versus apicem ferrugineis, fulvo-pilosa ; prothorace amplo, subgloboso, lateribus leniter apice fortius rotundatis, hoc medio tuberculis 2 fortibus ornato, disco posterius sat dense, in medio indistinctius punctato, basi supra scutellum breviter erecte hirta ; elytris brevissimis indistincte lineato-punctatis, interstitiis multipunctatis, a medio abrupte truncatis, declivitate ad latera et infra acute carinata-marginata, subconvexa, striato-punctata, interstitiis planis, pilis brevibus cum setis nonnullis longis tenuibus commixtis. Long. 4·5 millim.

Fem. Short, robust, very convex, somewhat shining, bright-reddish testaceous, the elytra ferruginous, darker posteriorly ; pubescence sparse, fulvous. Head very large, globose, alutaceous, front more

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shining towards the mouth, with scattered rather large punctures; mouth infuscate, thinly fringed; eyes oblong, scarcely sinuate anteriorly. Prothorax ample, broader than long, strongly convex, the sides slightly, the apex more strongly rounded, the latter with two prominent median blackish tubercles; surface before the transverse dorsal elevation with large transverse asperities, closer towards the middle, behind, punctured rather closely and distinctly at the sides, obsoletely over the middle, which is furnished before the scutellum with a dense tuft of short upstanding hairs, remaining pubescence scanty. Scutellum minute, rounded, infuscate. Elytra strongly declivous and retuse from before the middle to the apex, about a third longer than the prothorax, separately rounded and finely bordered at the base, the sides slightly tending to diverge behind, the apical borders seen from above abruptly inflexed, and forming an obtuse angle at the suture; surface convex from the base to the declivity with indistinct rows of feeble punctures, the flat interstices with finer scattered irregular punctures; declivity subabruptly rounded above into the cylindrical portion, margined at the sides and apex with an acute ridge, separated from the fundus by a slight gutter-like impression, fundus gently convex with subimpressed rows of shallow punctures carrying long fine hairs, interstices flat with close fine piliferous points, their hairs short and semi-accumbent. Underside and legs testaceous, the tibiæ closely and finely serrate.

Hab. INDIA, Chittagong Hills.

This fine *Xyleborus* is most nearly allied to *X. solidus*, Eichh., among described species. From that Australian species it differs in its larger size and broader shape, in the greater prominence of the apical tubercles, the more evidently transverse asperities and finer punctuation of the middle posterior portion of the prothorax, in the very scanty punctuation of the basal portion of the elytra, and in the very acute marginal carina and the flat non-tuberculate interstices of the declivity.

It is possible that the examples are not quite mature, and that the colour may be sometimes blackish. It is always difficult to determine whether light-coloured Scolytids are immature or not.

Xyleborus mancus, sp. n.

♀. Cylindrica, castanea, elytris apice picescentibus, breviter pilosa; prothorace antice fortiter rotundato, lateribus postice vix

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rotundatis, dorso medio transverse elevato, postice in medio dense subtiliter cribrose punctato et breviter hirto, linea media longitudinali subelevata; elytris prothorace longioribus, perindistincte lineato-punctatis, interstitiis irregulariter punctatis, apice oblique truncato-retuso, margine per totum acuto, subcirculari, fundo utrinque ad suturam gradatim elevato et medio subimpresso, haud omnino opaco, subirregulariter lineato-punctato, interstitiis haud perspicue punctatis. Long. 3·3 millim.

Fem. Closely allied to *X. amputatus*, Blandf. (Trans. Ent. Soc., Lond., 1894, p. 575). Rather larger and more robust. Front (concealed in the type of *X. amputatus*) convex, subopaque, rather closely and finely punctate with a short shining elevated longitudinal line above the middle of the shining blackish epistoma; eyes rather deeply emarginate. Sides of the prothorax nearly straight behind the middle, its surface as in *X. amputatus* but with the basal patch of piliferous punctures more conspicuous. Elytra much darker apically, nearly black, the fundus of the apical retuse surface distinctly less opaque (in *X. amputatus* it has not the slightest gloss), not concave on each side but gradually raised towards the suture, with a somewhat irregular surface, due to a slight impression on each side, the rows of punctures somewhat wavy, the punctures rather large, shallow subnitid impressions (in *X. amputatus* the rows are perfectly straight and the punctures are small and not shining), interstitial punctures not perceptible (evident in *X. amputatus*).

Hab. CEYLON (*E. E. Green*).

This species, though really distinct from *X. amputatus* upon comparison, is so far alike that I was unable to separate it by means of my former description, and was obliged to have recourse to my type of the latter species, which Mr. Lewis kindly lent me for the purpose of comparison.

Xyleborus discolor, sp. n.

♀. Forma *X. brevi*, Eichh., proxima, sed multo minor, elytris brevioribus, colore distincta. Curta, cylindrica, laete testacea; elytris nigris abrupte truncatis, truncatura circulari, breviter fulvo-pilosa. Long. 1.8 millim.

Fem. Allied to *X. brevis*, Eichh., but much smaller. Short, cylindrical, bright testaceous, with the elytra black. Head dull, the front rather finely punctate, with a fine raised median longitudinal line; mouth infuscate; eyes deeply emarginate. Prothorax as long as broad, the sides nearly straight behind, gradually rounded to the apex in an ellipse; discal elevation post-median, indistinct;

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surface in front with small granular elevations, behind subopaque, very finely punctured, closely towards the middle, which bears a brush of short erect fulvous hairs. Scutellum small, rounded triangular, black shining. Elytra about as long as the prothorax, cylindrical, abruptly truncate behind the middle, shining black, finely punctate, the punctures of the rows and interstices scarcely separable from each other; terminal surface strongly declivous, circular, defined above but not margined, the lateral and inferior margin not acute, covered with very short fulvous pubescence and hence subopaque, finely striate, the interstices quite flat. Underside and legs bright-testaceous, the anterior tibiæ narrow.

Hab. CEYLON (*E. E. Green*).

This little species is one of the best marked of the group of small forms to which it belongs. The bright testaceous colour of the body, black elytra, and fulvous, downy pubescence of their sharply curtailed extremities render it unmistakable even at a glance.

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XXI. *On some new species of African Pierinæ in the collection of the British Museum, with notes on seasonal forms of* Belenois. By ARTHUR G. BUTLER, Ph.D., F.L.S., &c.

[Read November 16th, 1898.]

WHILST arranging the Pierinæ of the genus *Phrissura*, I discovered three males of a species which is certainly undescribed, mixed up with the series of *P. sylvia* (the dry-season form of *P. eudoxia*), and in the Hewitson collection I discovered the female of the same species I now describe.

Phrissura perlucens, sp. n.

♂. Above nearly resembling *P. sylvia*, but with the inner edging of the black outer border of primaries more blurred, less distinctly dentate-sinuate, the basal patch of lemon yellow without the least tinge of orange; on the undersurface the border far more distinct than in *P. sylvia*, irrorated with dark brown, yellowish externally; the base bright lemon yellow as above (not orange, as in *P. sylvia*); the secondaries also with the costal area at base bright lemon yellow instead of orange. Expanse, 50—61 millim.

♀. Similar in pattern to the female of *P. sylvia*, but with the ground-colouring of all the wings above pure white; the border of primaries and marginal spots of secondaries rather broader than in *P. sylvia*; primaries below bright lemon yellow at base, slightly washed with saffron on costa; apical area irrorated with grey-brownish and with an oblique subapical stripe of the same colour; secondaries with the base of costal area golden yellow, slightly more saffron on costal margin: no trace of the ochreous bordering common to the undersurface of all the wings in *P. sylvia*. Expanse, 64 millim.

Hab. ANGOLA and GOLD COAST (*Mus. Brit.*).

Phrissura narcissus, sp. n.

♀. Primaries bright ochreous; a grey subapical crescentic band; veins pale buff, partly dividing a marginal series of black spots;

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secondaries bright lemon yellow with a marginal series of cordiform dark brown spots terminating the nervures; primaries below ochreous with pale creamy costa, the cell suffused with saffron towards the base, but not abruptly; subapical grey band obsolete, marginal black spots smaller than above, fringe black; secondaries butter yellow with deep saffron basi-costal area; spots on margin as above; pectus creamy yellow; abdomen flesh-tinted. Expanse, 59 millim.

Hab. ANGOLA (*Coll. Hewitson*).

This is so strikingly distinct from everything else in the genus that I do not hesitate to name it in spite of the fact that it is a female; the male will probably be found to have a broad blackish border to the primaries. In the genus *Belenois*, of which I have recently completed the arrangement, the seasonal forms are always tolerably well-defined. *Belenois*, though nearly related to *Phrissura*, has a different style of marking; the males never have a pencil of hair between the anal clasps as have those of *Phrissura;* the primaries as a rule are more produced, the costa being longer, so that the wing-outline more nearly resembles that of *Appias;* there are however exceptions to this rule in a few specimens which more nearly approach *Phrissura* in outline. A few notes on some of the seasonal forms in *Belenois* may perhaps be useful to the systematist; they follow the usual rules of variation which have, in many cases, been more or less satisfactorily proved by collectors and breeders of Pierinæ; so that there can be no reason for refusing to accept them as facts. If they are rejected as seasonal forms, they must be accepted as variations, inasmuch as (in nearly every case) the intermediate phase occurs.

Belenois hedyle, Cramer.

This is a wet-season phase, of which *B. rhena* is the female of the dry phase. In the Museum there are six males and one female of the wet phase in addition to five examples in the Hewitson collection; of a perfectly intermediate phase we have five males; of the dry phase we have three males and two females, one additional example being in the Hewitson collection.

Belenois thysa, Hopff.

The Angolan form of this species differs somewhat from the more Southern and the Eastern type of the species,

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representing a slight local variation of which *B. meldolæ* is the dry phase. The typical figures of the species represent the intermediate phase, the wet phase of which has heavier black borders with which the subapical spots on the primaries are often united; the dry phase is represented by *B. sabrata*. A singular form of the species occurs sporadically in the area bounded by the Victoria Nyanza and Lake Nyasa; the females of this form differ so remarkably in outline and in the more or less lilacine greyish suffusion of the under surface that one might be excused for believing that they represented a distinct species.

Belenois dentigera, Butl.

This species, which is related to *B. calypso*, was based upon a dry-season male collected by Emin Pasha. The intermediate phase is represented by *B. welwitschi* of Rogenhofer (who states that it was collected in Angola!); of this phase we have a male obtained by Emin Pasha at Kangasi and three males from Nyasa-land. Of the wet phase, a heavily marked and more brilliantly coloured edition of the intermediate phase, we possess four males and one female from Nyasa-land.

Belenois instabilis, Butl.

Of this species we possess both sexes of all the phases, the wet form of the female somewhat resembling that sex of *B. creona* on the upper surface; both sexes are very heavily black-veined on the under surface. The intermediate phase bears much resemblance on the under surface to the wet phase of *B. dentigera*, excepting that the insect is considerably smaller, the apical markings on the primaries are sulphur yellow and the median vein of the secondaries, with its branches, is black. In the dry form the black markings are reduced on both surfaces, and the secondaries below are more ochraceous.

Belenois subeida, Felder.

Related to the preceding; we possess only single males of the wet and intermediate phases and a female of the dry phase. The species doubtless replaces *B. instabilis* in North Africa: whilst it is much more heavily bordered on

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the upper surface, it is altogether less brilliantly coloured below.

Belenois crawshayi, Butl.

We now possess wet, intermediate, and dry phases of both sexes of this species; *B. diminuta* was based upon the female of the dry phase.

In the collection made by Dr. Gregory in British East Africa is a species related to the preceding which I confounded with the Eastern form of *B. zochalia*: a careful study of the two has now convinced me that this was an error, the form of the wings being constantly very different, and the costal margin of the primaries and the abdominal margin of the secondaries being noticeably shorter.

Belenois formosa, sp. n.

♂ *Belenois zochalia* (part), Butler, P.Z.S., 1894, p. 579, pl. xxxvii, fig. 3.

♀. Primaries white above, the basal area nacreous; secondaries white or pale sulphur yellow; markings as in *B. zochalia*.

At first I was inclined to regard this as the dry phase of the East-African representative of *B. zochalia*, but the coloration and vivid marking of the male are so distinctly characteristic of a wet-season phase, that I was compelled to abandon this idea as soon as it occurred to me. Undoubtedly the pattern of the females of both forms is very similar, but nevertheless I feel sure that two species exist; we have five males and three females of *B. formosa*.

Of typical *B. zochalia* from South Africa we have wet, intermediate, and dry forms of both sexes; they differ chiefly in the definition of the black markings on the under surface.

Belenois severina, Cramer.

Of *B. severina* we have an immense series commencing with the wet-season *B. infida* (P.Z.S., 1894, pl. xxxvii, figs. 1, 2), passing through two fairly defined intergrades, of which one is typical *B. severina*, to the extreme dry form, which nearly resembles *B. creona* on the under surface. *B. boguensis* of Felder is a Northern race of the species showing less variation, the wet phase being not much unlike the first intermediate phase of *B. severina*, but the dry phase more nearly approaches *B. creona*.

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Belenois leucogyne, Butl.

This interesting species seems to possess a dry phase only.

Belenois creona, Cramer.

The wet form of this species seems to be extremely rare; we possess only one pair; above it resembles the common intermediate phase, but on the under surface the veins are lilacine grey in the male and black in the female. The best characters for distinguishing *B. creona* from *B. severina* consist in the smallness of the subapical spots on the upper surface of the primaries in the males, the black and scarcely spotted border of the secondaries in this sex and the white ground-colour of the female streaked on the under surface with deep ochreous. *B. creona* is essentially a West-African species; *B. severina* Southern and Eastern.

Belenois johannæ, Butl.

I know this only as a dry-season phase; it is a very distinct species.

Belenois mesentina, Cramer.

We have a very extensive series of this species, *B. augusta* = *agrippina* = *lordaca* being the wet phase, *B. mesentina* = *syrinæ* intermediate, *B. auriginea* dry, and *B. taprobana* being an insular dry phase differing in the blacker outer border to the male primaries, on which the subapical spots are less prominent.

Belenois teutonia, Fabr.

The wet form is *B. clytie* = *niseia*; the intermediate form shows a narrow break between the discocellular bar and outer border in both the primaries and secondaries of the female, but no noticeable difference in the male; in the dry form the discocellular bar is well separated from the border, and the white spotting of the border in both sexes is clearly defined.

Belenois peristhene, Boisd.

The wet form has the secondaries below black with a submarginal row of orange spots. We have two examples

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from New Caledonia in which the whole basal area of the primaries below is also orange, as in *B. java*; these are probably either reversional sports or the result of hybridism between the two species. The intermediate form differs in having several squamose subbasal orange patches on the under surface of the secondaries; the dry form has the cell and a series of patches below it white, the basicostal patch and submarginal spots remaining orange.

Belenois clarissa, Butl.

The seasonal differences in this species much resemble those of *B. peristhene*, the orange spots of the under surface being replaced by sulphur yellow; we have all the phases in both sexes.

Of *B. picata* we possess only a dry-season phase.

Belenois java, Sparrm.

B. deiopeia, Don., is the dry phase. We possess an intermediate from the New Hebrides; as the species occurs as far to the East as the Friendly Group, it certainly crosses the range of *B. peristhene*, and is quite likely to hybridize with it.

Belenois raffrayi, Oberth.

This is a wet-season form, and, without examining specimens of the allied *B. margaritacea*, I would not suggest that there may be more than affinity between them. It is quite possible that they may be perfectly distinct.

Respecting *B. gidica*, much confusion has arisen; I may begin by stating emphatically that *B. gidica* is not the wet-season form of *B. abyssinica*, and that *B. allica* of Oberthür is not the *B. allica* of Boisduval, but is identical with *B. abyssinica*. Furthermore, there are two South-African species of the group, easily separated by any one who has an eye for form and pattern.

Belenois gidica, Godt.

Differs at a glance from *B. gidica* of authors in the lack of continuity between the discocellular black spot of primaries with the costal borders, the distinctly narrower and blacker outer borders of the primaries, the fourth white spot on which opens without break into the ground-colour, so as to form a quadrate excision of the

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border. On the under surface the differences are much greater; the apical brown border is unbroken, with three small whitish spots internally as above, whitish veins, and five tear-like whitish submarginal dots between the veins. Secondaries with irregular brown borders interrupted by diffused whitish spots internally and enclosing six distinct submarginal white spots; veins pale; an oblique abbreviated brown spot at the end of the cell, but no other markings. Expanse, 57 millim.

Hab. CAPE OF GOOD HOPE.

Two males of the wet-season phase of this very distinct species were in the Godman and Salvin collection associated with *B. gidica* of Trimen and others. To the latter I propose to restore the name of *B. westwoodi*, Wallgr.

Belenois abyssinica, Lucas.

The Godman and Salvin collection contained two males, and the Museum series a female of the wet-season phase of this species. It differs from the wet phase of *B. westwoodi* above in the almost confluent character of the marginal spots on the male secondaries; the differences below are considerable, the ground-colour being much yellower, and all the dark brown markings on the basal area of the secondaries being wholly erased, bringing it decidedly nearer to *B. gidica*.

The differences between the dry-season forms of the two species do not appear to be so marked, though they are of the same nature, the rusty ground-colour not being so well suited for emphasizing the absence of dark markings as the primrose yellow of the wet-season phase.

Belenois westwoodi, Wallgr.

We have a long series of this species, the female of which is very variable. I suspect that the most typical wet phase is represented by the more heavily bordered and distinctly marked examples, but the change from heavy to light borders is so gradual that I have not attempted to distinguish an intermediate phase. One of our female examples in which the upper surface is very lightly marked shows a distinct approach to the dry form in the coloration of the under surface. Of the dry phase we have five examples from Eastern Africa as far southward as Natal, and there is an equal number in the Hewitson collection.

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Belenois occidentis, sp. n.

Allied to *B. westwoodi*, but distinctly larger, the apical area of the primaries irrorated with grey, the outer border greyer than in *B. westwoodi*, the irregular transverse subapical band interrupted in the middle; the veins blackened to the cell, excepting the first two median branches; the discocellular black bars continued round the end of the cell as far as or beyond the emission of the second median branch; secondaries with a well-defined black discocellular dash and several black traces of the discal markings of the under surface; black marginal spots and fringe as usual. On the under surface nearly the whole of the veins are brown, darker on the primaries; in the wet phase the primaries show a grey basal patch terminating in a black discoidal streak; the black discocellular bar is continued broadly to the first median branch along which it runs to the middle, so that it forms a large Z-shaped character; in the dry phase the discocellular bar runs backward only half way to the origin of the first median branch. In the character of the secondaries this species is like *B. westwoodi* on the under surface. Expanse, 64 millim.

Hab. CONGO; LOANDA (*Mus. Brit.*).

These examples were received from the Godman and Salvin collection, a male (wet phase) from the Congo, and a pair (dry phase) from Loanda. There is very little doubt that this is the species for which Boisduval proposed his manuscript name of "*Pieris allica*," but Oberthür having published the name as applying to *B. abyssinica*, it has become a synonym and cannot now be resuscitated.

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XXII. *Considerations on the Genus* Tetracanthagyna *Selys.*

By Robert McLachlan, F.R.S., &c.

[Read December 7th, 1898.]

When Mr. C. O. Waterhouse in 1877 and 1878 described in our "Proceedings" and "Transactions" a grand dragonfly, under the name *Gynacantha plagiata*, he acted, I believe, on my suggestion as to its generic position. In 1883 my friend Baron de Selys, in his "Synopsis des Æschnines" (part i, classification), subdivided *Gynacantha*, Rambur, and proposed the subgeneric term *Tetracanthagyna* for *G. plagiata*, being influenced principally by the conformation of the 10th ventral segment in the female. Prof. Karsch, in 1891, in his "Kritik des Systems der Aeschniden" (in which he propounded a new scheme which, I venture to think, is a distinct step in advance), refused to recognise *Tetracanthagyna* even as a subgenus.

Having to examine the materials available for a study of the genus, of which there are certainly several species, I arrived at the conclusion that not only is *Tetracanthagyna* valid, but also that its relationship to *Gynacantha* is perhaps not so intimate as has been thought; the membranule is more developed, the network less dense, and the abdomen more robust with, if I mistake not, a less strongly chitinous integument. A character which may, or may not, prove to be of importance, is the sinuate contour of the ventral surface, caused by constrictions; nor should the very short styliform appendages of the female be overlooked. Even from the limited materials at present available, there are indications that the teeth on the 10th ventral segment of the female will prove to be somewhat variable, but probably individually rather than specifically.

I propose to describe in detail what appears to be a new species, then to give in a tabular form characters of the described, and some new, species, ending by noticing some specimens the position of which seems uncertain.

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TETRACANTHAGYNA VITTATA, sp. n.

♂ ♀. Face dingy olive yellow, labium shining blackish-brown, tips of mandibles black; frons (excepting a line at the base) and vertex wholly blackish, the vertex with a strong anterior ridge, and a broad deep longitudinal groove, it is clothed with erect blackish hairs; vesicle black; antennae reddish, black at the base; occiput black; back of head blackish, but with an olivaceous orbital margin. Prothorax blackish, its hinder margin produced into a broad median obtuse lobe, and slightly excised on either side. Thorax brownish-black, clothed with greyish-brown hairs, the ante-alar sinus olive-brown; anteriorly there are indications (at any rate in the ♀) of short narrow ante-humeral pale lines; sides with two very broad greyish-yellow bands, one mesopleural, the other metapleural, separated by a still broader mesopleural band of the dark ground colour; pectus blackish; legs with dark reddish femora (black at the tips) and black tibiæ and tarsi, spines black, claws piceous. Abdomen robust, apparently wholly blackish, with no indications of markings in the dead insect (but in the somewhat immature ♂ there is an indistinct olivaceous tinge).

Wings comparatively narrow, the apex obtuse but somewhat produced; vitreous, but the anterior portion is occupied by a brownish-black vitta from the base to the pterostigma; at the base this vitta is broad and its lower edge extends into the lower basal area, then it is limited by the upper edge of the principal triangle, then it occupies (partly in a fainter manner) the area between the subnodal and short sectors for some distance, then it is limited by the subnodal sector, then slightly invading the area between the nodal and subnodal sectors and then bounded by the principal sector as far as the pterostigma or slightly beyond; in this vitta many of the areoles below the median nervure have a pale centre (but in a somewhat irregular manner), and most of the marginal nervules (at the base almost as far as the triangle) are pale, and in addition (especially in the costal area as far as the pterostigma) are also narrowly margined with pale; costal nervure olivaceous (almost whitish in the somewhat immature ♂), much incrassated towards the base; neuration otherwise black, not very dense for the size of the insect; pterostigma very small (4 mm.), brown (almost white in the somewhat immature ♂); membranule whitish, well-defined; subnodal sector furcating far before the origin of the pterostigma; in the anterior wings there are about 34 ante-nodal and 23 post-nodal nervules, 8—10 hyper-trigonal, 7 in the lower basal area, 1 in the inner triangle, 7 cellules in the principal triangle (the two inner divided by a longitudinal nervule in the ♀, and

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symmetrically irregular in the ♂ individual before me, although regular in the posterior wings); nodal sector much bent just before the pterostigma (somewhat as in [the genus Hemianax), with several double cellules below the bend; 4—5 rows of cellules between the subnodal sector and its branch; 5 cellules between the subnodal and the interposed sector at the widest part; a single row of cellules between the sectors of the triangle. (In the posterior wings the area between the sectors of the triangle is dilated for some distance, with two rows of cellules, followed by one row.)

♂. Anal triangle 3-celled; the inner upper cellule formed by an oblique nervule (in one wing there is a small supplementary cellule on the inner margin). On the abdomen the oreillettes are subquadrate, black, finely limate on the edge. The 8th dorsal segment is produced into a small acute tooth in the middle of its posterior margin, on either side of which are smaller teeth; the 9th has a stronger and blunter tooth-like production, and in the 10th there is a terminal hump, in all cases extensions of the dorsal carina, which on the 10th is much elevated, and has a deep broad sulcus on either side. Appendages black; the superior about as long as the 9th and 10th segments united (8 mm.), inserted well below the elevated hump of the segment, foliaceous, but slender, nearly straight, but slightly curved upwards from the middle; viewed above the inner edge is gradually dilated from base and apex to the middle, the tip ending in a sharp out-turned tooth or spine; the apical portion for some distance is occupied internally by a deep groove bounded by the longitudinal carina and occasioning a torsion which causes an appearance as of an obtuse subapical dilatation if viewed laterally; the apical half internally has a strong fringe of hairs. Inferior appendage one-third shorter, upcurved if viewed laterally, slender, gradually narrowing from the base, it is sulcated above, and the apex is obtuse and slightly emarginate.

♀. The 8th and 9th dorsal segments strongly produced into a triangular tooth in the middle of the posterior margin, 10th scarcely produced, but there are a few apical denticules. Appendages short, black, straight, styliform and cylindrical, scarcely extending beyond the abdominal extremity. Tenth ventral segment having (in the individual before me) three large and one small acute teeth. Valves of the 9th segment not extending to apex of 10th, with black filiform appendages.

Length of abdomen ♂ 80 mm. (with appendages), ♀ 70 mm. Length of posterior wing ♂ 75 mm., ♀ 80 mm. Greatest breadth of posterior wing ♂ 23 mm., ♀ 22 mm. Expanse of anterior wings ♂ 159 mm., ♀ 169 mm.

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Hab. NORTH BORNEO (*Waterstradt*) one ♂ and ♀ (the ♂ slightly immature). *Coll. McLachlan.*

Distinctly related to *T. plagiata*, but can scarcely be identical therewith. Taking size and strength combined this and *T. plagiata* may be considered the largest of known recent Odonata, for although some Agrionines (such as *Megaloprepus cænulatus*) somewhat exceed them in wing-expanse, they are feeble animals in comparison.

I proceed to give a synoptical table.

A. Legs black; the femora dark reddish, except at the apex. Sides of the thorax with two broad pale bands. Eighth and ninth dorsal segments of the abdomen in the ♀ ending in a tooth. Neuration black. The area between the two sectors of the triangle in the anterior wings not dilated at the base, and with only a single row of cellules (one cellule is indicated as double in each anterior wing in the figure of *T. plagiata*). A blackish vitta (broad at the base) extends from the base to the pterostigma (or further).

1. In addition to the costal vitta there is a broad dark band on all the wings of the ♀ between the nodus and the pterostigma (or further). Length of posterior wing 79 mm. Length of abdomen 69 mm. . . . . T. PLAGIATA, Waterhouse

Hab. BORNEO. Type in the collection of Sir Hugh Low, not seen by me recently.

2. There is no band in addition to the costal vitta in either sex. Anterior wings with about 34 antenodals and 23 postnodals. Length of posterior wing ♂ 75 mm., ♀ 80 mm. Length of abdomen ♀ 70 mm. . . . T. VITTATA, McLachl. (*vide supra*).

Hab. NORTH BORNEO. Types in Coll. McLachlan.

B. Legs wholly reddish. Ninth dorsal segment only, of the ♀ ending in a sharp tooth.

1. Sides of the thorax reddish with no evident pale bands. Neuration reddish. In the wings there is a brown costal vitta extending from the base to the pterostigma (or nearly so). The area between the two sectors of the triangle in the anterior wings not dilated at the base, and with only a single row of cellules (this area is not mentioned in the description of *T. degorsi*).

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a. In addition to the costal vitta there is a broad brown band (in the ♀ only?) between the nodus and pterostigma. Anterior wings with about 36–38 antenodals and 24–25 postnodals. Length of posterior wing 65–68 mm. Length of abdomen 59–60 mm. . . . . T. BRUNNEA, sp. nov.

Hab. NORTH BORNEO. Two ♀ in Coll. McLachlan.

aa. No brown band between the nodus and pterostigma in either sex. Anterior wings with 38 antenodals and 25 postnodals. Length of posterior wing ♂ 56 mm., ♀ 65 mm. Length of abdomen ♀ 65 mm. . . . . T. DEGORSI, Martin. (Bull. Soc. Ent. Fr., 1895, p. cccxciii.)

Hab. BORNEO. ♂ ♀ Coll. Martin, not seen by me. It is just possible that *T. brunnea* may be founded on more mature individuals of *degorsi*; but more material is necessary.

2. Sides of the thorax with two broad pale bands. Neuration black. In the wings (♀) there is no dark costal vitta, but a dark brown mark at the base extending a short distance along the subcostal area; no brown band, but the apical portion of the wing is slightly tinged. Anterior wings with about 28 antenodals and 18 postnodals. The area between the two sectors of the triangle in the anterior wings dilated at the base and with two rows of cellules, followed by one. Length of posterior wing 61 mm. Length of abdomen 58 mm. . . . . T. WATERHOUSEI (Selys MS.) sp. n.

Hab. BORNEO, one ♀ in the British Museum bearing the MS. name here adopted; one ♀ in coll. McLachlan, without locality.

This would seem to be a very distinct species by the restriction of the wing markings, notwithstanding that the deep black neuration indicates maturity. The neuration is also less dense, and it is the only species at present known with the area between the sectors of the triangle in the *anterior* wings dilated at the base and with two rows of cellules.

It remains to allude to certain specimens that I cannot locate with certainty.

In a male from Pulo Nias (Coll. McLachlan) the legs are

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wholly reddish, there are no pale bands on the sides of the thorax, a smoky blackish costal vitta extends from the base to the nodus (or slightly beyond), no dark bands on the wings, pterostigma whitish, neuration black, the area between the two sectors of the triangle not dilated and with only one row of cellules. About 36 antenodals and 23 postnodals int he anterior wing. Length of posterior wing 60 mm. Length of abdomen (with appendages) 63 mm.

The anal characters are as follows:—There is a slight tooth at the extremity of the dorsal carina on the 9th segment, but the 10th is not sensibly produced at its extremity. There is a strong constriction at the junction of the 6th and 7th ventral segments, reproduced in a smaller degree at the junction of the 7th and 8th (this seems to some extent to exist in the other species). Superior appendages slightly shorter than the 9th and 10th segments, slender, foliaceous, (less twisted than in *T. vittata*), ending in a small sharp tooth. Inferior appendage one-half shorter, narrowing from base to apex, upcurved, the apex obtuse and slightly emarginate.

A male from Deli (Sumatra) is described by Prof. Karsch in Entomol. Nachr. xvii. (1891), p. 345, and referred to *T. plagiata*. The wing-expanse is given as 135 mm., and the length of the abdomen as 90 mm. (thus the expanse is much less, and the abdomen considerably longer than in my ♂ of *T. vittata*); there is apparently no dark band on the wings. Nothing is said of the colour of the legs, or sides of the thorax, nor of the condition of the area between the sectors of the triangle. It is evidently very much larger than my male from Pulo Nias.

A female example from Laha (Sumatra), in the Amsterdam Museum, is referred to *T. plagiata* by Baron de Selys (Ann. Mus. Civ. Genov. (2), vii., p. 472). The length of the posterior wing is given as 74 mm., and of the abdomen 58 mm. Presumably it has a costal vitta and transverse band, but no details are to hand.

DECEMBER 22, 1898.

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THE

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

LONDON

FOR THE YEAR 1898.

February 2nd, 1898.

Mr. G. H. VERRALL, Vice-President, in the Chair.

Election of Fellows.

Mr. L. C. CHAWNER, of Forest Bank, Lyndhurst; Mr. F. A. HERON, B.A., of the British Museum (Natural History); Mr. HENRY STEBBING, of The Shawe, Jarvis Brook, Tunbridge Wells; and Mr. E. J. BURGESS-SOPP, of Saxholme, Hoylake, Cheshire, were elected Fellows of the Society.

Exhibitions, etc.

A letter was read from the Secretaries of the International Congress of Zoology, calling attention to the meeting to be commenced at Cambridge on August 23rd, and extending to the Fellows of the Society the cordial invitation of the Executive Committee to be present.

The Secretary also read a letter from Mr. A. D. Michael, F.L.S., of 9, Cadogan Mansions, S.W., asking if any entomologists, who might find insects attacked by mites (*Acari*) among their disused boxes, would be willing to send him such insects, with the mites still on them or accompanying

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them, or at least, the mites themselves, with the name of the insect given in all cases, for the purpose of his forthcoming monograph of the Tyroglyphidæ.

Mr. J. W. Tutt showed a fine series of forms of *Hemerophila abruptaria*, Thunb., on which he read the following note:

"Mr. W. G. Pearce has, during the years 1895, 1896, 1897, been accustomed to take occasional dark specimens of *Hemerophila abruptaria* in his garden at Holloway. From these captures he, and his friend, Mr. W. Southey, have bred a considerable number of interesting forms, some of which are exhibited. The first was taken on May 14th, 1895, at the front of the house (probably attracted by light). The second was taken on May 23rd, 1895, a male, *in cop.* with a normal female on a bush in the garden. Eggs from the dark female, and from the ordinary female paired with the dark male, were procured, and in April and May, 1896, several dark and ordinary forms were the result. Pairings from these were obtained and some of the larvæ feeding up rapidly produced a partial second brood, some of which were dark. Other captures of the dark form of both sexes were made in the garden in 1896 and in 1897. Mr. Southey and Mr. Pearce both bred many examples, some forty-four emerging altogether. Among the specimens may be observed: 1, a male form much yellower (or more orange) than the type; 2, specimens much suffused in ground colour on the forewings; 3, specimens with the transverse lines on the hindwings changed into a broad band extending towards the base, and with the outer margin of the forewings much suffused, extending to the characteristic transverse band; 4, a bright mahogany-brown form with a pale apical dash and traces of a pale submarginal line on both fore- and hindwings; 5, examples entirely suffused with fuscous-brown, with faint traces of the actual black markings—one or two of these being entirely black-brown; 6, one gynandromorphous example, with the wings and right antenna of the female type, the left antenna being strongly pectinated. In all the dark forms the thorax is of the normal pale coloration; there is a distinct purplish hue about some of the second brood specimens bred in August, 1896, by Mr. Southey."

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He also exhibited two specimens of *Dianthœcia luteago*, bred by the Rev. F. Lowe, from larvæ obtained in Guernsey, and of a very distinct character, having a tendency to the ochreous coloration of the type-form, but being differently marked from those figured by Hübner. They did not bear the slightest resemblance to var. *brunneago*, Esp., var. *olbiena*, Hb.-Gey., var. *barrettii*, Doubl., nor the grey form, taken in Cornwall last summer, for which he had suggested the name *ficklini*. According to Guenée the colour of the species varied from a more or less pure and intense yellow to greyish in some specimens.

On behalf of Mr. Heyne, Mr. JACOBY exhibited a series of temperature-varieties of Lepidoptera.

Papers.

Mr. G. H. CARPENTER read a paper by himself and the Rev. W. F. JOHNSON on "The Larva of *Pelophila borealis*," describing its structure and life-history. On the larval characters the species, hitherto considered as of doubtful relationship, was regarded as being closely allied to *Elaphrus*.

Papers were communicated by Mr. F. D. GODMAN, F.R.S., and Mr. O. SALVIN, F.R.S., on "New Species of American Rhopalocera," and by Mr. M. JACOBY, "On Some Phytophagous Coleoptera (Eumolpidæ) from the Islands of Mauritius and Réunion."

February, 16th, 1898.

Mr. G. H. VERRALL, Vice-President, in the Chair.

Exhibitions.

Mr. G. C. CHAMPION exhibited specimens of *Isodermus gayi*, Spin., from Punta Arenas, Straits of Magellan, and *I. planus*, Er., from Hobart, Tasmania, both found by Mr. J. J. Walker. The genus *Isoderma* belonging to the Aradidæ, afforded an interesting case of geographical distribution, the only known species occurring in Chili, Australia, and Tasmania.

Mr. C. O. WATERHOUSE referred to the similar distribution of other species of insects, which went to support the theory of a former connexion between South America and Australia.

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Mr. CHAMPION also showed an example of *Bagous lutosus*, Gyll., from Sweden. This insect had been on the British list since the time of Stephens, but possibly in error, as all the examples he had seen in collections were wrongly so named.

Mr. JACOBY exhibited a pair of the singular weevil, *Apoderus tenuissimus*, Pasc., from the Philippines.

Mr. BURR exhibited examples of grasshoppers of the family Eumastacidæ, resembling dead leaves, and referred to the following species: *Chorætypus gallinaceus* (Fabr.), *C. fenestratus*, Serv., *Erianthus*, sp. n., and *Plagiotriptus hippiscus* (Gerst.). This was the only family of Acridiodea in which such resemblances were found.

Dr. CHAPMAN exhibited a specimen of *Zygæna exulans* with six wings, the supernumerary pair arising between the normal left forewing, and the corresponding leg on the same side. The uppermost wing appeared normal in every respect, the second was a reduced copy of the basal half of a forewing, and the third a portion of crumpled wing-structure.

Mr. O. E. JANSON, exhibited specimens of the rare *Papilio mikado*, Leech, and of a pale variety taken in the province of Higo, S. Japan. Several examples of the variety, in which the pale markings were very much extended upon the discal portion of all the wings, were captured in company with the typical form.

Mr. G. B. ROUTLEDGE showed a variety of *Enodia hyperanthus* taken near Carlisle, and banded on the underside like a *Cœnonympha*; also two moths from the same neighbourhood, captured by Mr. F. H. Day, which, after careful comparison, were regarded by Mr. Tutt as females of *Hydrilla palustris*. This sex was almost or quite undiscovered in Great Britain, and the occurrence of the species so far from the fen-district was remarkable.

Papers.

Mr. H. J. ELWES, F.R.S., read a paper entitled, "A Further Revision of the Genus *Erebia*," which was illustrated by the exhibition of males of each and females of all but five of the species hitherto described, and one from British Columbia which he described as new under the name of *E. vidleri*.

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Though he had published a revision of this genus in the Transactions of the Society in 1889, yet, as a great deal of new material had come to hand, he thought it was time for a fresh revision, especially with regard to the genitalia, which had been very carefully examined and figured by Dr. Chapman, and threw great light on the affinities of some of the more obscure species in the genus. His attention had first been called to this by Herr Calberla of Dresden, who had shown that the supposed *melas* from the Tyrol, which M. Oberthur had named *melas-nicholli*, was really a variety of *E. glacialis* which appeared to be fairly constant in the Dolomite mountains of the Tyrol, occasionally appearing as an aberration in the Western and Central Alps. He had been much assisted in his investigations by a fine series of specimens from Siberia lent to him by M. Alphéraky from the collection of the Grand Duke Nicholas Michailovich. Tracing the geographical distribution, he stated that the principal European centres of the genus were the Alps and Pyrenees, only a few forms occurring in Scandinavia, while the Ural Mountains and Caucasus were comparatively very poor in species; the genus became abundant in E. Siberia. Though it was impossible as yet to pronounce a positive opinion as to the distinctness of some of the forms, it seemed clear that there was a distinct connexion between the Erebias of Eastern Siberia and those hitherto known from North America, of which only one from Boothia Felix seemed to be really peculiar to the New Continent, the other seven being identical with, or very nearly allied to, Siberian and European species. He had been invited by the Director of the British Museum to re-arrange their series of *Erebia*, which would now, he thought, owing to the large accessions of the Frey, and Godman and Salvin collections, be a very fine one. He appealed to the Fellows of the Society to complete as far as possible the blanks remaining in the National collection, and pointed out that there was still very much to be learned even about the species of the European Alps, where two apparently quite distinct new Erebias had been discovered in very accessible localities since he wrote his last paper. The life-history of most of the species still remained to be worked out.

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Dr. CHAPMAN also read a paper "On the Species of the Genus *Erebia*, a Review based on the male appendages," illustrated with drawings of these organs in about seventy-five reputed species.

The appendages throughout the genus presented much uniformity in the tegumen or sickle; in the valvæ or clasps which were marked by bold arrangement of spines in most species, there was much variety, but they might be arranged according to their general form into groups which were also natural groups in the genus, judging from other characters.

Taking *E. manto* or *E. euryale* as a type, the "grass Erebias" (*E. epiphron*, *E. melampus*, &c.) appeared to be direct derivatives therefrom and to form a group. *E. ceto* with some eastern forms seemed nearest to this, and *E. æthiops* followed. A group with *E. glacialis* as type had a very bold clasp, whilst in the next group were placed *E. neoridas*, *E. zapateri*, *E. pronoe*, *E. scipio*, *E. lefebvrei*, *E. nerine*, *E. goante*, *E. lappona*, &c. *E. tyndarus* seemed naturally to come here, and whilst *E. epistygne* resembled *E. tyndarus*, it seemed to require a group for itself. *E. disa*, *E. embla*, and *E. ero* formed another group.

There was a large group of Asiatic-American species divisible into several subgroups and all characterised by a difference in neuration from the preceding groups of European type. *E. medusa*, both in neuration and clasp-form, seemed to be a transition form between these two large sections.

E. evias, whose facies was that of the *neoridas* group had a clasp-form like nothing else in the genus and a neuration approaching that of the Asiatic group—its probable place was preceding *E. disa*.

The chief items of revision as to specific rank were the placing of *E. melas* as a form of *E. nerine*, the recognition of *E. magdalina* and *E. erinna* as forms of *E. fasciata*, of *E. ero* as identical with *E. rossii*, and of *E. cæcilia* (Pyrenees *nec* Switzerland) and *E. gorgone* as good species.

A few species were regarded as not properly belonging to the genus.

In connexion with the above papers Mr. TUTT exhibited and made remarks on:

1, A long series of *Erebia nerine* from the Mendel Pass, the

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males with a well-developed fulvous band on the upper side of the forewings, the band of the females tending to orange. The underside of the hindwings of the males black, with a pale transverse band varying in intensity, some very pale; the underside of the hindwings of the females with a dark grey median band, edged externally with a dark fuscous line.

A similar series from the neighbourhood of Cortina, the males with the fulvous band on the upper side of the forewings much suffused (in some practically obsolete); the specimens rather smaller in size than the Mendel individuals. The band of the females paler orange than the Mendel specimens (two females with the band suffused). The underside of the hindwings of the males almost uniformly black, with scarcely any trace of pale transverse band; the underside of the hindwings of the females almost unicolorous whitish grey with a strongly-developed marginal row of ocellated spots. The underside of the Cortina females contrasted strongly with that of those from Mendel.

2, *Erebia glacialis* ab. *alecto* from various localities.

3, *Erebia lappona*. A long series from Campiglio, Pejo, the Falzarego Pass, the Nuvolau (Cortina), and The Engadine.

4, *E. euryale*. Two drawers from various localities exhibiting different races from the Val Ferrex (Mont de la Saxe), Campiglio, Mendel Pass, Toblach, Falzarego Pass, &c., and extending from perfectly black specimens (without fulvous bands or spots) to female specimens indistinguishable from typical *E. ligea*.

5, A series of *E. ligea*, chiefly from the neighbourhood of Cortina, where no intermediates between this species and extreme specimens of ab. (*et* var.) *ocellaris* were to be found.

6, A series of *Erebia æthiops* chiefly from various localities in the Tyrol.

In the ensuing discussion Mr. Verrall called attention to the necessity, which these exhibitions showed, of working with large numbers of specimens, and to the facts mentioned by Mr. Elwes as to species being perfectly distinct from each other in one part of their range, and not in another. The results which had been arrived at by study of the genitalia amply fulfilled Mr. McLachlan's prediction, made in 1872,

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that these structures would prove of great importance in systematic lepidopterology.

Mr. KIRBY mentioned with respect to the supposed occurrence of *E. ligea* in Great Britain, that the two reputed British specimens had been carefully examined by Dr. Butler, who referred one to *E. ligea* and the other to *E. euryale*.

March 2nd, 1898.

Mr. G. H. VERRALL, Vice-President, in the Chair.

Election of Fellows.

The following were elected Fellows of the Society: Miss MARGARET FOUNTAINE, 7, Lansdowne Place, Bath; Mr. J. H. CARPENTER, Shirley, St. James's Road, Sutton, Surrey; Mr. G. O. DAY, Parr's Bank House, Knutsford; Mr. F. E. FILER, 58, Southwark Bridge Road, S.E.; Mr. R. HAMLYN-HARRIS, The Conifers, Hambrook, Bristol; Mr. E. J. LEWIS, 4, Elwick Road, Ashford; Mr. T. MADDISON, South Bailey, Durham; Mr. W. H. MOUSLEY, Orchard House, Mundesley; and Prof. ENZIO REUTER, Helsingfors, Finland.

Exhibitions, etc.

Lord WALSINGHAM exhibited a series of the larger and more striking species of Xyloryctinæ, a subfamily of the Gelechiadæ, especially characteristic of the Australian fauna. The series illustrated the life-histories and the great disparity in colour and form between the sexes of many species, and included the following specimens: *Uzucha humeralis*, Walk., ♂, ♀, larva, pupæ and mantle; *Pilostibes enchidias*, Meyr., ♀; *Cryptophaga russata*, Butl., ♂, ♀; *C. rubescens*, Lew., ♂, ♀, larva, pupæ; *C. irrorata*, Lew., ♂, ♀, pupæ; *C. albicosta*, Lew., ♀; *C. nubila*, Lucas, ♀; *Zitua balteata*, Walk., ♂, ♀, pupæ, burrow; *Z. nigricincta*, Turner, ♂, ♀, pupæ; *Z.? epadelpha*, Meyr., ♂, ♀, larva, pupæ, mantle; *Z.? intermedia*, Lucas, ♂, ♀, pupæ; *Z.? sacerdos*, MS., ♂, ♀, pupa, burrow; *Maroga unipunctana*, Don., ♂, ♀, pupæ; *M. mythica*, Meyr.?, ♂, ♀; *M. undosa*, Lucas, ♂, ♀, pupæ; *Compsotorna oligarchica*, Meyr., ♂, ♀; *Illidgea epigramma*,

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Meyr., ♂, ♀, pupæ, pupa in burrow; *Xylorycta flavicosta*, Lucas, ♂, ♀, pupæ, mantle; *Telecrates porphyrinella*, Walk., ♂, ♀, pupa.

On this exhibition Lord Walsingham read the following notes:

"The genus *Cryptophasa* (which has been very properly corrected to *Cryptophaga* by Mr. Meyrick), as well as the species published in Lewin's 'Natural History of the Lepidopterous Insects of New South Wales' (London, 1805), have been accredited to Lewin, but it would appear that they should be attributed to M'Leay on the authority of a letter from A. M'Leay to the Rev. W. Kirby, dated 20th February, 1805, and published in Freeman's 'Life of the Rev. William Kirby,' pp. 226—27 (1852). In this letter M'Leay says 'I have been describing eighteen Botany Bay Lepidopterous insects, which are about to be published by Lewin, with all their changes and natural history. Amongst them, there is a most distinct new genus (in my opinion), which I propose to name *Nycterobius* from Νυκτεροβίος, noctu victum quærens. The caterpillars form for themselves holes in the trunks of trees, where they hide themselves in the day-time: at night they come out and gnaw off leaves, which they drag to their holes; and when they have provided a sufficiency for the next day's consumption, they retire and feed leisurely, with their heads toward the mouth of the hole, which is covered by a curious contrivance.'

"This note can only relate to *Cryptophasa*, and this name was probably adopted as being more descriptive, if read in the sense of Mr. Meyrick's correction of the word to *Cryptophaga*, which was obviously intended.

"The following notes have been compiled from a series of very interesting letters received from Mr. Dodd of Queensland, to whose exertions I am indebted for the rich series of bred examples of many species, from which the few specimens exhibited have been chosen.

"The larger species of *Cryptophaga* are very rarely met with in the perfect state, even by experienced collectors who spend the greater part of their time collecting in the bush; indeed, it is not unusual for a whole season to pass by without a single

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specimen being seen. Some of the species are occasionally taken at light, and several of them feign death when roughly disturbed. The species have therefore to be bred; and this is not a very easy matter, for, as a rule, the larvæ are very restless and wander about, although some will stay in their burrows after the branch has been cut down, and will feed upon leaves placed near. *C. rubescens* is particularly difficult to deal with. It is therefore necessary to collect the insects in the pupal state, when they are not easy to find, owing to their having destroyed the conspicuous mantle before sealing up the burrow. The system found most successful is to locate the larvæ, and in October, after they have pupated, to cut down the branches containing the burrows.

"The larvæ must always leave their burrows at night when in quest of food, and seem to wander about a good deal, for quite a network of silken threads may be noticed along the branches which they traverse. As a rule they crawl up the branch in which they reside, though the threads may sometimes be noticed upon a different branch. They have been observed at night biting off the leaves and returning with them to their burrow (which generally is only excavated to the length of the larva), retiring tail first and securing the leaf to the web, which masks the entrance of the burrow. When the leaves become too dry, they are evidently cast off by most of the species, but the webs of *Z. nigricincta* often have a dozen or more fragments attached to them. The bark around and under the protective covering is eaten to the wood, and kept clean of the exuding gum by a spreading of silk. Most of the species of the family do this; if they did not, the hole and surrounding space would be covered with gum and the pupa would be suffocated. Sometimes the gum escapes and, breaking down this protecti ve barrier, does occasion the death of the pupa by suffocation. A clear smooth space is therefore kept under, above, and on each side of the web, extending under the outside bark. Upon the approach of pupation the web immediately in front of the entrance to the tunnel is torn away, and the hole itself is closed with a stiff parchment-like plug or operculum. The protective mantle which masks the entrance to the burrow is sometimes securely

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fastened to the tongue of bark jutting beneath, and to this web the excrement is freely attached, as are also the discarded skins of the larva itself—often four or five heads may be found upon the mantle.

"The larva of *Uzucha humeralis* feeds in a different way: it spins a broad and long web upon the surface of the tree, feeding principally upon the thin outer bark, though it occasionally gnaws down to the wood. The web often extends for a considerable distance, 12 by $1\frac{1}{2}$ inches being a common size. On large trees the web is generally very broad, and it is then not so long, being sometimes wider than a man's hand; whilst on thin branches the web may be 2 feet long and only an inch wide. The larva not only eats the bark under the protective web, but gnaws or eats away the outlying bark for an inch or more on either side. This gnawed bark if undevoured is added to the increasing mantle, as is also the frass. The larva of *Uzucha* does not burrow into the wood like *Cryptophaga*; as the *Eucalyptus* and *Angophora* shed their outer bark about the time the insect pupates, special precautions are taken that the pupa shall not fall to the ground with the shed bark. When about to pupate the larva forms a hole at the lower end of the web, perforating the bark about to be shed, and spins a stout cocoon with a tube at its upper extremity. The web-covering gradually falls away and the outer bark is shed, leaving the cocoon attached to what has now become the outer bark of the tree, where it may be easily found and detached with a knife. It is believed that the gnawed space (often extending to several inches on one side) is really occasioned by the larva moving its mantle laterally when it has finished the bark in one particular spot; this is confirmed by the fact that the bare gnawed area is not found in front of the web.

"The Xyloryctinæ are preyed upon by a host of ichneumons and other flies, and a species of cricket is frequently dislodged from the burrows,—whether it devours the larva or pupa or whether it merely takes possession of the empty burrow has not yet been ascertained. That many of the larvæ lose their lives when out at night foraging for leaves is clearly shown by the number of untenanted burrows met with.

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"The pupa of one species at least (*C. rubescens*), as shown by an example in the drawer, assumes a very peculiar form which may or may not be protective. There are on the head a pair of chitinous excrescences arranged in the form of open mandibles; they themselves are of course immovable but, having regard to the fact that the pupa lies in a narrow hole with its head towards the opening, and that it has at least sufficient freedom to move the head from one side to the other, it is difficult to resist the impression that an enemy attempting to enter the burrow would regard these nippers as formidable objects. Is it possible that the resemblance to the jaws of some of the larger *Hymenoptera* may be specially intended to alarm crickets? These Mr. Dodd has frequently found in the burrows of other species which do not possess the appendages, and possibly also in those of *C. rubescens*.

"One of the most striking peculiarities of the genus *Cryptophaga* is to be found in the differences between the males and females. In some few cases (e.g. *C. rubescens* and *C. irrorata*) the males and females are alike and therefore quite normal in this respect; but in numerous other cases the male develops more or less black colouring while the female remains white, instead of being, as one might have expected, darker than the male. In such species as *Z. epadelpha* and *Z. intermedia*, the hindwings of the male become black, the forewings being white like those of the female. In *Z. sacerdos* the male is black but retains a white thorax, while in *Z. nigricincta* the male is wholly slaty grey, and in the luteous species *Z. balteata* the male is dark chocolate, and differs so widely in shape and size from the female as to have been put at one time in a separate genus. I leave it to those who have studied such subjects with more attention than myself to endeavour to give a rational interpretation of these differences. So far as my experience goes, the prevailing rule among the *Lepidoptera* is that the female is more sluggish and more protected by coloration than the male, but here we have apparently an exactly opposite process. The males appear to be gradually assuming a protective colouring, which in the conspicuous white females is wholly disregarded, with the single exception

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of *M. unipunctana*, which has a nearly white male and a grey female."

Mr. GAHAN exhibited a locust, *Acridium ægyptium* (= *tartaricum*), taken in a house in Hanover Square, and probably imported in vegetables.

Mr. KIRKALDY exhibited specimens of water-bugs, including *Enicocephalus culicis* (Uhl.) and *Gerris robustus* (Uhl.), both taken for the first time in Mexico, by Prof. Carl Baker; also a male of the extraordinary *Rheumatobates rileyi*, Bergr., from New York State, *Trepobates pictus*, Herr.-Schäff., from Alabama, and *Gerris aspera*, Fieb., from Scotland.

Mr. CHAMPION showed specimens of *Helota kolbei*, Rits., and *H. fulviventris*, Kolbe, from Haining, China, and of *Apogonia cribricollis*, Burm., from Hong-Kong, all captured by Mr. J. J. Walker, during the voyage of H.M.S. 'Penguin.'

A discussion arose on the reported occurrence of the San José scale, *Aspidiotus perniciosus*, in Great Britain.

Mr. R. NEWSTEAD stated that, during nine years' work on Coccidæ, he had never once met with this species among scale-insects taken in this country and sent to him for identification. It was impossible even for an expert to distinguish it, without careful microscopical preparation and examination, from among the thirty or more known species of *Aspidiotus*, and any attempt to identify it on imported fruit by naked-eye observation, or with a hand-lens, was therefore quite impracticable. The risk of its distribution by being imported on fruit was small; there was, however, much more likelihood of its introduction on plants.

At the same time, he saw no reason to suppose that it would be more injurious in this country than the common *Mytilaspis pomorum* (*Aspidiotus conchiformis*, Curt.); in America the San José scale had several generations in the year, sometimes as many as five, but in this country it would probably conform with the habits of all other scale-insects at present investigated, and become single-brooded, by which modification its powers of multiplication would be materially diminished.

Subsequent speakers agreed with Mr. Newstead's conclusions, and the encouragement of a panic, such as had

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arisen in the case of the Colorado Beetle, was generally deprecated.

Mr. GAHAN stated that specimens of a beetle of the family Cassididæ had lately been received at the Natural History Museum from an official source, with inquiries as to whether they were examples of the San José scale.

March 16th, 1898.

Mr. R. MCLACHLAN, F.R.S., Vice-President and Treasurer, in the Chair.

Exhibitions.

Mr. CHAMPION exhibited specimens of *Acanthia inodora*, A. Dugès, from Guanajuato, Mexico. This insect, a congener with the common Bed-bug, was found in fowl-houses, where it attacked poultry.

Mr. WAINWRIGHT exhibited a locust found alive in broccoli at Birmingham. The insect was identified by Mr. Burr as *Acridium ægyptium*.

Mr. TUTT showed a series of captured examples of *Calligenia miniata*, varying in colour and the amount of black markings, one example being a clear yellow and another orange.

The SECRETARY exhibited part of a series of holograph letters, &c., which he had discovered among old papers in the Society's Library, including communications from Kirby, Spence, Darwin, Hope, Yarrell, Westwood, Babington, Wollaston, J. F. Stephens, Lacordaire, Kolenati, Guenée, LeConte, and other entomologists. That from Darwin, written in 1853, unfortunately contained nothing of importance, but some of the others were interesting; as an example, the MS. of the original account of the Tsetse-fly communicated to the Society by Spence might be mentioned.

Amongst other documents exhibited were the voting papers used in the first election of the Society, held in 1833. From these it appeared that the name of Mr. G. R. Gray, of the

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British Museum, was originally printed for nomination as Secretary, but that of Westwood was substituted in all the papers save one, which bore that of Edward Newman.

Another paper shown was the MS. record of the visit of a deputation from the Council to Kensington Palace, June 29th, 1835, when Her Majesty the Queen (then Princess Victoria) and the Duchess of Kent signed their names on the first page of the signature-book still used by the Society.

The Secretary proposed to preserve a selection of these letters in an autograph book, and suggested that Fellows, who possessed other letters interesting from their contents or from the status of the writers, might perhaps be disposed to contribute them for that purpose. If of too recent a date to be fitly inserted, they could be preserved until a suitable time arrived for their incorporation. He thought that such a collection, in which the handwriting of past entomologists could be scrutinised, would be of real and practical value.

Papers.

A paper by Mr. E. E. Green, of Punduluoya, Ceylon, entitled "Further notes on *Dyscritina*, Westwood," was read and illustrated by specimens and drawings.

The author had discovered two distinct species of *Dyscritina*, which he was able to keep in captivity, and rear from the early larval stage to that of the imago. The characteristic abdominal cerci increased in length with successive moults, until in *D. longisetosa* they became much larger than the body. In the penultimate stadium they were lost without a moult, being probably bitten off by the possessor, the long basal joints alone remaining. The imago was a typical earwig, the forceps being developed within the basal joints of the cerci. Sensory organs on the antennæ and palpi were described, as well as the habits of both species.

In the ensuing discussion Mr. M. Burr referred the imagos to the genera *Cylindrogaster* or *Diplatys*, that of *D. longisetosa* being, he believed, a known species. The genus *Dyscritina* must therefore be sunk.

Mr. Gahan observed that the fact of the forceps being developed within the basal joints of the cerci alone did not

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prove that they were not homologous with the entire cerci; perhaps the internal structure of the latter was retracted by a histolytic process before amputation. In *Forficula* he had found evident traces of meristic division in the forceps of embryos which were nearly on the point of hatching.

Dr. CHAPMAN read a paper entitled "Some remarks on *Heterogyna penella*," giving a full account of its life-history. The female was destitute of all appendages whatever, and only left the pupal case for pairing, returning within it about ten minutes later. It possessed an organic connexion with the pupal case in the situation of the legs. The larvæ were hatched within the case and devoured the remains of the mother. The pupa of the female was quite peculiar and specialized in structure, and utterly unlike that of the male. The larva-like character of the female imago he did not regard as ancestral. On anatomical characters he assigned to the insect a place near the Zygænidæ.

Sir GEORGE F. HAMPSON pointed out that Herrich-Schäffer had suggested on other grounds that *Heterogyna* was probably a link between the Psychidæ and Zygænidæ.

April 6th, 1898.

Mr. R. MCLACHLAN, F.R.S., Vice-President and Treasurer, in the Chair.

Election of a Fellow.

Sir ARCHIBALD BUCHAN-HEPBURN, Bart., of Smeaton-Hepburn, Prestonkirk, E. Lothian, N.B., was elected a Fellow of the Society.

Exhibitions.

On behalf of Mr. Greenshields, Mr. JACOBY exhibited specimens of the longicorn beetle, *Micropsalis durnfordi*, Burm., from Patagonia. Mr. Greenshields, who was present, stated that this species, remarkable for the great development of the palpi, was originally taken by Darwin; his own examples were taken hiding in thorny bushes, locally known as "Calefatas," in a dry water-course. It was necessary to beat these bushes before the insects would come out. They

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were very local, and he had never taken them except in one particular spot, about 15 miles from Bahia Camerones, on December 27th, 1897; but they were not plentiful.

Mr. CHAMPION exhibited European examples of *Harpalus frölichi*, a newly-discovered British species.

Mr. B. O. BOWER showed living larvæ of *Caradrina ambigua*, an insect which had recently occurred in countless numbers. They were bred from ova laid by a female taken on the South Devon coast, and fed indiscriminately on low plants.

Papers.

Mr. M. BURR read a paper supplementary to Mr. Green's previous communication on *Dyscritina*, and referred the imagos definitely to the genus *Diplatys*, *D. longisetosa*, Westw., being a good species, and Mr. Green's new form proving to be *D. nigriceps*, Kirby.

Dr. CHAPMAN read a paper on the larva of *Eriocephala allionella*, which he stated to be essentially similar to that of *E. calthella*, previously described by him.

May 4th, 1898.

Mr. G. H. VERRALL, Vice-President, in the Chair.

Election of a Fellow.

Mr. H. G. PALLISER, of 6, Mount Park Road, Ealing, W., was elected a Fellow of the Society.

Exhibitions.

Colonel YERBURY exhibited and read the following notes on a series of Diptera collected at Hyères during March and April, 1898, and including the following species:—

SYRPHIDÆ.

1. *Mallota fuciformis*, Fabr., fairly common at blackthorn bloom.
2. *Merodon clavipes*, Fabr., uncommon.

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3. *Brachypalpus valgus*, Panz., rare—the English species, *B. bimaculatus*, is very near this, but differs in having a dark instead of yellow arista. Thereafter the two species may possibly be united.
4. *Chrysotoxum intermedium*, Meig., very common.
5. *Chrysotoxum sylvarum*, Meig., common.
6. *Callicera fagesii*, Guér., rare—the most interesting specimen obtained. This species was described by Guérin, in the 'Iconographie du Règne Animal,' from Montpellier, but the name does not appear in Dr. Gobert's 'Catalogue des Diptères de France.' According to the key given by Rondani (Dipt. Ital. ii, p. 209) this species should be *C. bertolinii* (Rond.); it is probable therefore that *C. bertolinii* is only a synonym of *C. fagesii*. Whilst referring to the above key it may be remarked that a *Callicera* obtained near Vizzavona in Corsica is clearly *C. rosserii* (Rond.).

The species appears, however, to be doubtfully distinct from *C. ænea*.

7. *Eumerus olivaceus*, Loew, one specimen. The species is described from Sicily, but is not in Gobert's Catalogue.
8. *Syrphus euchromus*, Kowarz, rare.
9. *Syrphus triangulifer ?*, rare.
10. *Syrphus auricollis*, var. *maculicornis ?*, uncommon.
11. *Pelecteria ruficeps*, Macq., common.

MUSCIDÆ.

12. *Tachina fera*, L., very common.
13. *Macquartia flavipes*, Meig., very common.
14. *Bothria pascuorum*, Rond., common.
15. *Gymnosoma rotundatum*, L., rare.
16. *Gonia atra*, Meig., common.
17. *Gonia ornata*, Meig., rare, a pair only.
18. *Phorocera concinnata*, Meig., bred from pupæ of *Pieris brassicæ*. A number of dipterous pupæ bred from *Aporia crataegi* have been brought home, but the flies have not yet emerged.

ASILIDÆ.

19. *Andrenosoma atra*, L., rare.

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BOMBYLIIDÆ.

20. *Anthrax paniscus*, Rossi, one specimen.
21. *Bombylius pictus*, Panz., very common.
22. *Bombylius ater*, Scop., rare.
23. *Bombylius undatus*, very common.
24. *Bombylius*, sp. near *venosus ?*, very common.
25. *Bombylius*, sp. near *nubilus ?*, common. It was hoped that the above two species would have been identified before being exhibited at the meeting, but two days' work having failed to identify them, they had been handed over to Mr. Austen at the British Museum who up to that time had failed to identify them.
26. *Pelidnoptera nigripennis*, Fabr., one specimen. Though a widely-distributed species, it appears to be nowhere common.
27. *Limnia*, sp. *? bivittata*, Macq., a few.
28. *Platystoma*, sp. near *umbrarum* but distinct—rare. It does not seem to agree with any described species.

Mr. BARRETT showed the following aberrant forms of British species of Lepidoptera:—

Cynthia cardui—with a white ground. (Boynton, Yorkshire—the Rev. G. M. Smith):

Vanessa C-album—greatly clouded with black, the black spots shaded off and the marginal markings altered into ill-defined clouds. (Sandhurst, Gloucestershire—W. H. Jones):

Melitæa artemis—almost devoid of markings, pale chestnut. (Gloucester—the Rev. G. M. Smith):

Clisiocampa neustria ♀—a very fine specimen with the forewings of unusual breadth, wholly of a rich red colour, with the bands of the forewings but little darker. (Gloucester—E. W. Lifton):

Nemeophila plantaginis ♂—fore- and hindwings suffused with smoky-black, through which the usual markings were distinct. (Gloucester—C. G. Clutterbuck):

Ditto. ♀—four with orange-red hindwings, and a stripe of the same colour along the costa of the forewings. (Gloucester—E. W. Lifton):

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Agrotis cinerea—large example, like the Continental form, greyish-drab, well marked. (Farnborough, Warwickshire—W. H. Jones):

Phigalia pilosaria ♂—the usual grey colouring replaced by ochreous, and the hindwings tinged with the same. (Farnborough—W. H. Jones):

Coremia ferrugata—with the transverse bands exceptionally well shown by intermediate pale stripes. (Gloucester—C. G. Clutterbuck):

and a pupa of *Pygæra bucephala*, destroyed by *Cordyceps militaris*, also from Gloucester.

Mr. Waterhouse exhibited two burnished golden beetles, *Anoplognathus aureus* from Queensland, and *Plusiotis resplendens* from Panama, which he stated to be interesting examples of a similar result being attained by a process of natural selection in two species of the same family in widely separated localities. Many members of the family had a slight tendency to show metallic colours. It would be interesting to ascertain whether there were any similarity in their surroundings in the two countries which would make this golden appearance an advantage, or whether it might be considered a "warning colour." Allied species, however, appeared to be edible.

Mr. Champion stated that he had found metallic species of *Plusiotis* in Central America at an elevation of 5,000 ft., flying out of reach round the tops of trees in flower. Most of the Lamellicorns he took were found floating in the shallow waters of a lagoon.

Mr. Walker exhibited specimens of the rare *Philonthus fuscus*, Grav., found in a *Cossus*-eaten poplar in Chatham Dockyard at the end of April.

Papers.

Mr. R. McLachlan communicated a paper on the "Neuroptera-Planipennia taken by the Rev. A. E. Eaton in Algeria.

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June 1st, 1898.

Mr. R. Trimen, F.R.S., President, in the Chair.

Election of Fellows.

Prof. B. Grassi, M. Hippolyte Lucas, and Dr. August Weismann were elected Honorary Fellows; and Mr. G. B. Dixon, of St. Peter's Road, Leicester, was elected an Ordinary Fellow of the Society.

Exhibitions.

Mr. P. B. Mason exhibited a specimen of the rare *Lathridius filum* from his own herbarium. It had been previously taken at Edinburgh by McNab, and he understood that an example had been found in a sealed envelope containing *Marchantia* from Franz Josef Land.

Mr. J. J. Walker exhibited a singular blue variety of *Carabus monilis*, Fabr., resembling in colour *C. intricatus*, and taken at Iwade, Kent, in flood-rubbish in May.

Mr. F. Merrifield forwarded for exhibition larvæ of the "Corsican form," var. *ichnusa*, of *Aglais urticæ*.

Mr. G. C. Champion called attention to Mr. A. Somerville's recently-published sheet of the County and Vice-county divisions of the British Isles for biological purposes, and a discussion ensued thereon.

Papers.

Papers were communicated by Sir G. F. Hampson, Bart., on "The Moths of the Lesser Antilles," and by Mr. J. H. Leech on "Lepidoptera Heterocera from Northern China, Japan, and Corea."

October 5th, 1898.

Mr. R. Trimen, F.R.S., President, in the Chair.

Election of Fellows.

Mr. T. B. Fletcher, of H.M.S. "Centurion," China Station; Mr. Claude Fuller, of the Department of Agricul-

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ture, Cape Town; Mr. ALEXANDER GREENSHIELDS, of 38, Blenheim Gardens, Willesden, N.W.; and Mr. OLIVER J. JANSON, of Cestria, Claremont Road, Highgate, N., were elected Fellows, and Mr. JOHN W. DOWNING, of 45, Trevelyan Road, Tooting Graveney, S.W., was re-elected a Fellow of the Society.

Announcements.

The PRESIDENT announced, with deep regret, the deaths of Mr. Osbert Salvin, F.R.S., a Member of the Council, and of Dr. E. Candéze, a Fellow of the Society, which had taken place since the previous meeting.

The President also announced that the late Mrs. Stainton had bequeathed to the Society such entomological works from her husband's library as were not already in its possession. This bequest was of great importance, and would add to the Library a large number of works, many of which, formerly in the library of J. F. Stephens, were old and now scarce. Among the more important additions were copies of Clerck's "Icones insectorum rariorum," Say's "American Entomology" (1817)—a work of extreme rarity, Goeze's "Entomologische Beyträge"—complete, "Der Naturforscher"—complete, Linnæus's "Systema Naturæ," ed. x., Godart and Duponchel's "Lépidoptères de France," Harris's "The Aurelian," ed. i., Donovan's "Insects of New Holland," and Sepp's "Nederlandsche Insecten." There were also numerous modern works dealing with the lepidopterous fauna of Europe. The number of bound volumes selected for the Society amounted to about 500, and there were in addition a large number of pamphlets, "separata" and works in unbound parts. There was also the beautiful series of original drawings by C. M. Curtis and Westwood for Stephens's "Illustrations of British Entomology."

Exhibitions.

Mr. J. J. WALKER exhibited a black form of *Clytus mysticus*, L. (var. *hieroglyphicus*), taken by Mr. Newstead at Chester, where about one per cent. of the specimens were of that variety; also a black variety of *Leiopus nebulosus*, L., from the New Forest.

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Mr. J. W. Tutt exhibited for Dr. Riding a series of *Zonosoma annulata*, Schulze, with its aberrant forms *obsoleta* and *biobsoleta*. He said that the form of this species with the ring on the forewings absent was first taken some years ago by D'Orville at Alphington, about twelve miles from Buckerell, where the specimens exhibited were captured or bred. During the last seven years Dr. Riding had twice netted the aberration without the black ring on the forewings, and in each year since 1893 he had bred one or more similar examples, ten in all, from larvæ collected in the autumn, or their progeny. In September, 1897, larvæ were obtained, which pupated, and produced imagos in May, 1898, five, all males, being of the form *obsoleta*; three others had the "omicron" very indistinct; four were transitional between the latter form and the type with a well-defined ring. The aberrations equalled 7 per cent. of the brood. Three also had the rings on the hindwings ill-developed. The form with the "omicron" absent on the forewings had been named *obsoleta*, and that with it absent on both fore- and hindwings *biobsoleta* (Ent. Rec., x, p. 239). Three males of the May aberrations were paired with normal females on May 7, 8 and 11. Ova laid, hatched May 20, pupated by June 23, the imagos appearing from June 30 to July 7. There were 78 altogether, 21 (14 ♂, 7 ♀) ab. *obsoleta*, the rest normal. Four of the ab. *obsoleta* were obtained on June 30, and July 1, and six others later. Their ova began to hatch July 9, the larvæ pupated early in August, the imagos appearing August 10 to 19, 15 per cent. of the pupæ emerging. All except one were females, and were of the form *obsoleta*, one was ab. *biobsoleta*, and fourteen had the black rings on the hindwings very imperfect.

Mr. Tutt also exhibited an example of *Euchloe cardamines*, irregularly suffused with black markings, and a series of local varieties of Lepidoptera from Wigtonshire, taken by Mr. R. S. Gordon, and including forms of *Cœnonympha typhon*, *Nemeophila russula*, *Dasychira fascelina*, *Gnophos obscuraria*, *Boarmia lichenaria*, *Cidaria comitata*, &c.

Mr. S. Image exhibited a specimen of *Acidalia herbariata*, taken in July on the wall of a shop in Southampton Row, W.C.

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Prof. E. B. POULTON exhibited a series of *Precis octavia*, (Cram.) var. *natalensis* Staud., and *Precis sesamus*, Trim., both captured and bred by Mr. G. A. K. Marshall at Salisbury, Mashunaland (5000 ft.) and read the following notes thereon :—

"The specimens exhibited prove conclusively (as Mr. Marshall has shown in the July number of 'The Annals and Magazine of Natural History,' p. 30) that these two butterflies, which differ so entirely in appearance and even in shape, size and habits, are seasonal forms of a single species. Mr. Marshall deserves the thanks of all naturalists for this discovery of the most wonderful example of seasonal dimorphism as yet known, and for the generous manner in which he has despatched to this country the invaluable material constituting his evidence, so as to make it accessible for all time in the British Museum and Hope Collection.

"Entomology is deeply indebted to Mr. Marshall for his liberality now and at other times in placing large quantities of valuable material at the disposal of investigators, and for his readiness in undertaking biological observations; and I desire specially to thank him for constant help, and for the valuable information contained in his letters, some of which I hope to lay before the Society.

"The relationship between *Precis octavia-natalensis* and *P. sesamus* has been described by Mr. Trimen (S. Afr. Butt., i, and iii, app.), who connected the two forms by a number of comparatively rare intermediate varieties, which, having regard to the fact that the forms themselves had been captured *in coitu*, he regarded as probably hybrids. The conclusion that the two forms were examples of seasonal dimorphism was reached by Mr. C. N. Barker and independently by Mr. Marshall (Trans. Ent. Soc. Lond., 1896, p. 557).

"Of this conclusion the specimens exhibited furnish absolute proof. They include in the first place specimens captured by Mr. Marshall towards the end of the wet (summer) and beginning of the dry (winter) seasons.

The red form (*natalensis*) was captured on Feb. 13, 1898, (a pair *in coitu*) and Feb. 20, the blue form (*sesamus*), on March 2, 12 and 16, and April 2. The latter form was

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noted by Mr. Marshall to become dominant about the middle of March.

"Larvæ previously captured also produced *sesamus* at this period, whereas an exactly similar individual that had been placed in a damp jar on March 23 and pupated April 1, produced on April 13 the typical *natalensis* now exhibited. It would be of the utmost value to have many more experiments of the kind.

"Of far greater importance is the fact that Mr. Marshall has succeeded in breeding *sesamus* from *natalensis* in three cases ('Ann. and Mag. Nat. Hist.,' *l.c.*); two are exhibited, the third is in the British Museum. Of the former, one parent laid three eggs on Feb. 27, of which two produced butterflies, one a typical *sesamus* (larva, March 5–31; pupa March 31 to April 15), the other a red *natalensis* tending slightly towards *sesamus* in its heavy black markings and blue-marked border (larva March 5 to April 5; pupa April 5–20). The second parent laid one egg on March 6 which produced a typical *sesamus* (larva March 12 to April 7; pupa April 7—30). This larva was placed in a damp jar from March 30 to April 5, but the 'dry form' of imago emerged. The third example, in the British Museum, is a *sesamus* bred from an egg laid by the summer form on Feb. 13 (larva, Feb. 19 to March 20; pupa, March 20 to April 4).

"As to the meaning of this seasonal dimorphism, I agree with Mr. Marshall's suggestion that the red *natalensis*, appearing as it does in the keener struggle[1] of the warm

[1] Mr. Blandford has pointed out, and the objection occurred to me independently, that the press of life in the warm damp summer may not, and probably does not, mean greater chance of destruction for any individual insect, the larger needs of enemies being more than compensated for by an increased supply of food. The question can probably be decided on the spot, and I am writing to Mr. Marshall on the subject. In this climate the argument certainly holds good, the danger to individuals of the comparatively few winter species being probably far greater than to those of the numerous summer forms. Granted that somewhat similar conditions exist in S. Africa, it might appear that the mimetic form would be found at the time of greater stress, viz., the dry winter season. But in England, although there are abundant examples of insects with warning colouring and many which mimic them in the summer, when there is a plentiful supply of palatable food, in winter none are to be

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damp summer, is probably an incipient mimic of an Acræan type of colour and markings. Mr. Marshall has suggested that *natalensis* presents many similarities to *Acræa acara*, Hew., especially upon the under side of the wings. The resemblance is probably closer when the insects are flying, the most noticeable difference being in the shape of the wings.

"It is in favour of this interpretation that a comparison with allied species of *Precis* tends to show that the blue form is ancestral and the red a recent departure; furthermore, the latter differs from the former and all its allies in the general similarity of the upper and under sides of the wings—a characteristic of the Acræinæ, as of all specially protected groups of butterflies.

"Mr. Marshall's suggestions command increased confidence because of his intimate knowledge of the habits of the two forms. His description of the wide differences therein, as well as in their appearance, is full of interest. The red *natalensis* is described as frequenting higher and more open country, while *sesamus* is found in shady places and gardens, and is distinctly warier and more difficult of approach when not feeding.

"Problems of the deepest interest remain to be attacked. Thus Mr. Trimen has described the pupæ of the two forms as differing, and Mr. Marshall considers that both are certainly procryptic in colouring, that of *sesamus* being gilded and con-

seen. Those, such as Coccinellidæ, which exist in the perfect form, hide themselves. The reason probably is that the amount of palatable food available is not sufficient to make it safe to rely on unpalatability, accompanied by warning colouring. Experiments with hungry animals support this view. It is possible that the conditions are similar in S. Africa, and that warning colours are more characteristic of the wet than of the dry season, thus affording greater opportunities for mimetic resemblance. If it should hereafter be shown that *Precis* is to some extent unpalatable, and that its resemblance to an Acræan type is synaposematic rather than pseudaposematic, the parallelism with our own fauna would be even closer, the conspicuous species which hide and thus adopt procryptic habits being represented by one which gives rise to another brood with markedly procryptic colouring and habits. It should be noted, however, that Mr. Marshall (*l.c.*) is strongly of opinion that the species is not unpalatable, and that the colours of the summer form are not aposematic.—E. B. Poulton, November, 1898.

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cealed by its harmony with the yellow winter foliage, while that of *natalensis* is dull brownish-black, with black patches on the wings, and is protected among the dark withered leaves of the moist summer. In one case he has bred the red form from a gilded pupa, but never *sesamus* from a dark one. It would be of great interest to ascertain whether these pupæ exhibit true seasonal differences, or whether, as seems more probable, the mature larvæ are susceptible to the colours of their immediate environment, as has been proved to be the case with those of several of the allied Vanessidæ.

"Of still more importance is the decision as to the cause or causes of the seasonal differences of the imago. On this question Mr. Marshall maintains that 'it at once becomes evident that the directly exciting cause is a climatic one' (*l.c.*, p. 37), and he argues that moisture, rather than temperature, supplies the efficient stimulus. The great want in the matter is experimental inquiry on as extensive a scale as possible, carried on over a large part of the year, so as to include larvæ and pupæ, that in the ordinary course certainly produce the blue form, as well as those that produce the red, and those that, at intermediate times, are known to produce both forms.

"Concerning those last-mentioned, Mr. Marshall has shown conclusively that the offspring of a single parent, brought up under the same conditions, may belong to both forms; in fact, in his experiment already described, the summer form emerged five days later (*i.e.*, when the winter season was to that extent advanced) than the winter form. This fact leads us to contemplate the possibility that the change of form is due to internal causes and independent of, although on the whole synchronous with, the seasons.

"And even if some exciting cause be proved to be necessary, it is probable there are great differences in the internally caused degree of susceptibility to stimulus in the two seasons, while a mixed susceptibility exists in the intermediate period.

"It is likely that Mr. Marshall's observations are to be explained by one or other of these alternatives."

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The PRESIDENT discussed Prof. Poulton's exhibit, and also congratulated Mr. Marshall on the importance of his discoveries.

On behalf of Dr. Knaggs, Mr. SOUTH exhibited series of (*a*) *Dicrorhampha alpinana*, Staint. *nec* Treit. (6 ex.); (*b*) *D. flavidorsana*, Knaggs (7 ex.); (*c*) *D. quæstionana*, Zell. (4 ex.); (*d*) *D. petiverella*, Linn. (7 ex.); and read the following notes thereon:—

"The specimen at the head of series *b* is the type of *D. flavidorsana*, Knaggs, taken by Mr. C. G. Barrett at Haslemere, about the year 1864, and for some time considered to be a variety of *D. alpinana*, Staint. (Manual, ii, p. 114). Subsequently Dr. Knaggs concluded that it was a distinct species and described and figured it in the "Entomologist's Annual" for 1867. He also published a more detailed description in the "Entomologist's Monthly Magazine" (iii, pp. 176, 177), where he doubtfully referred two examples of a *Dicrorampha*, taken on the North Devon coast by Mr. E. G. Meek, to *flavidorsana*. These last are now known to be really *D. petiverella*, and are at the head of the series of that species exhibited this evening.

"In 1878 Zeller described *D. quæstionana* (Stett. Ent. Zeit.), and it has been pointed out that the last-named is undoubtedly identical with *D. alpinana* of Stainton's Manual, though not with *D. alpinana*, Tr. Zeller's name has therefore been adopted for the species under consideration. Although it is somewhat darker than either *alpinana*, Staint., or *quæstionana*, Zeller, there can be no doubt, I think, that *flavidorsana*, Knaggs, is specifically identical with them; hence, as it is the earlier name, it should be adopted for the species.

"I may add that *D. flavidorsana* was not uncommon in May, 1881, among *Chrysanthemum leucanthemum* and *Matricaria inodora* var. *salina* growing on the rocks at Woody Bay, North Devon (Entom., xiv, p. 159)."

Mr. BARRETT exhibited and made remarks on specimens of *Lozopera beatricella*, Wals., taken at Folkestone by Mr. W. Purdey and new to the locality, and showed for comparison series of the following allied species: *L. francillonana*,

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L. dilucidana, and *L. smeathmanniana*, from Great Britain, *L. eryngiana* from Germany, and *L. sanguinana* from Hungary.

Mr. Porritt showed examples of *Arctia lubricipeda*, reared this season, and probably the darkest ever bred in this country, some of them being almost black. They had been obtained by continued selection of the parents from successive broods during the past five years. With them were exhibited a pair representing the darkest examples of five years ago, the contrast being very marked.

Mr. R. Adkin exhibited, on behalf of Mr. Wm. Reid of Pitcaple, series of *Tæniocampa gothica* bred through four or five generations from selected parents. The ova were obtained in the first instance from wild females taken in the Rannoch district, none of the male parents being known, and only about two in a hundred of the first broods reared followed the particular form of their respective female parents. These were again bred from with the result that the greater portion of the most recent broods were true to their particular forms. The series exhibited included, among others, forms in which the "gothic" mark was strongly produced, in black-brown in one and bright chestnut in another; while in others it was absent. The ground-colour of the wings of the various series also showed great divergence. This exhibit also comprised some remarkable forms of *Abraxas grossulariata* from Pitcaple, in which the central area of the wings was devoid of markings with the exception of the discoidal spots, which were unusually large and round; the form was said to be peculiar to the neighbourhood of Pitcaple: also a series of *Melanthia bicolorata*, var. *plumbata*, and of strongly-marked forms of *Pachnobia hyperborea*, both from Rannoch.

Colonel Yerbury exhibited the following species of Diptera from Scotland: *Laphria flava*—only recorded once previously from Great Britain, *Syrphus annulipes*—found in plenty but usually a rare insect, *S. topiarius*, *Eristalis rupium*, *Xylota abiens*, *X. confinis*—one previous British capture, *Spilomyia fallax*—one previous British capture, *Physocephala nigra*, *Cephenomyia rufibarbis*, and *Pogonota hircus*—very common, usually rare; also a series of *Volucella bombylans* to show the

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difference between the English and Scotch races; and *Trichopalpus fraternus*, from Wicken Fen, a species new to the British fauna.

Papers.

Mr. F. MERRIFIELD read a paper, illustrated by a large number of specimens, on "The Colouring of Pupæ of *P. machaon* and *P. napi* caused by the exposure to coloured surroundings of the larvæ preparing to pupate."

It had generally been considered that the larva of *P. machaon* was insusceptible to its surroundings when at the period of pupation, but at the instance of Prof. Poulton he had tried experiments last summer which proved that this was not the case. Of eleven pupæ of the first brood obtained in July, six larvæ were set to pupate on dark sticks; four of these were of the bone-coloured form, but a fifth was intermediate and the sixth fell to the earth, where it formed a green misshapen pupa. Of the five larvæ set to pupate on white sticks of peeled willow, four pupated on them and were all green, the fifth pupated on the white muslin top and was bone-coloured. Of seven other pupæ that were found to have attached themselves to the stems of the green carrot tops on which they were fed, six were green and one bone-coloured. This made a strong case, but experiments tried on a larger number of the larvæ of the second brood in September were conclusive. Of 16 pupated on black paper or dark sticks, all but one were bone-coloured, and most of them dark, four that pupated on green carrot tops were all green, and of 19 others that pupated on yellow or orange all but one were green. Various intermediate colours gave mixed results; absolute darkness produced five bone-coloured pupæ but of a pale hue. Seventy-two pupæ had been obtained, and all these were exhibited, as were the pupæ or pupa-cases of the eleven of the summer brood that had pupated. Several hundred pupæ of the second brood of *P. napi* were also exhibited, and these were shown to be exceedingly sensitive. Of ten on black paper all were dusky with much spotting of dark brown, so were seven out of eight on dark sticks, the eighth being green. Of twelve on green cabbage leaves or on the glass of the bottle containing them the majority were green or

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greenish; seven out of eight of those on yellow paper, and all the eleven on orange leno were green; of seven in absolute darkness six were green, two much spotted with dark brown, one bone-coloured with much spotting. He also exhibited 28 pupæ of *P. brassicæ* and about 40 of *P. rapæ*, with results in accordance with those obtained and recorded by Prof. Poulton. In the case of both these species he had some confined during the whole period of susceptibility to clear glass, with no substances near that reflected any colours or white or black; the results very nearly resembled some kept in absolute darkness, except that those on the clear glass were a little darker. One very interesting *napi* exhibit was that of the sheet glass roof of a breeding cage in two compartments, one having the interior partly orange and partly yellow, the other black; in the orange-yellow compartment 46 had pupated on the roof on which orange leno had been placed, transmitting orange light, and all but four of these were green with very little dark spotting; in the other compartment 34 had pupated on the glass roof which had been covered outside with opaque black paper and all of them were bone-coloured, most of them much spotted with dark brown. He thought it was impossible to doubt that much of the colouring was protective.

Mr. Bateson said that he had lately bred *P. napi* on a large scale, and as regards that species he could quite confirm Mr. Merrifield's observations. His own experiments had been undertaken with a different object, but he had frequently noticed that there was a fairly close correspondence between the colour of the pupæ and that of the substances to which they were attached, though exceptions to this rule were not uncommon. He had moreover observed that in this respect there was considerable difference between different families of larvæ. In his experiments the offspring of each pair were kept separate, and in some families many larvæ pupated on the food plant, while in others scarcely any did so. In some families the pupal colours conformed in nearly every case, while in other families the unconforming pupæ were numerous. The pupæ were often clustered together in little groups, and individuals composing such clusters sometimes agreed with each other in conforming or in not conforming.

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He did not propose on that occasion to discuss the general proposition that the colour-resemblance was in these cases a protection; but he pointed out that if a larva had the power of forming a green pupa when attached to a green plant the conformity of colour would make the pupa less conspicuous only so long as the plant remained green. In the case of the summer brood of *napi*, for instance, this resemblance might perhaps be effective, though in this case the pupal period was very short, only two or three weeks. But in order that the resemblance may benefit pupæ which over-winter it is necessary that the green plant to which green pupæ are attached should remain green in the winter. His own pupæ had turned green on several food-plants which wither and go brown: in these cases the pupæ became conspicuous again.

To form a sound judgment on this matter it would be necessary to know how the pupæ occur in nature. Pupæ of *P. napi* were hard to find. Had any one found the green pupæ in the wild state?

Prof. POULTON wished to congratulate Mr. Merrifield on the results he had obtained. He was particularly interested to know that the pupæ of *P. machaon* had now been proved to be sensitive. His own experiments on the species led him to infer the opposite, but they had been conducted with very few individuals, and he had always hoped that the species would be investigated on a large scale.

The results obtained by Mr. Merrifield upon *Pieris napi* were very striking and showed that the mature larvæ were most sensitive to the colours of their surroundings. The strong influence of orange and yellow backgrounds in producing green pupæ was corroborated by his own experience and confirmed the conclusion reached in his earlier experiments, that the efficiency of the greens of nature in producing green pupæ (and larvæ) in sensitive species was due to the orange and yellow rays which they reflect.

He exhibited some pupæ of *Pieris brassicæ* which had been rendered black-spotted and green by black and yellow surroundings respectively, and a few pupæ of *Papilio podalirius* which seemed to indicate that that species was sensitive. In some experiments which he had conducted during the past

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summer upon the struggle for existence in pupæ, very large numbers of pupæ of *Vanessa urticæ* were produced upon backgrounds of various colours, with results which confirmed the conclusions he had already recorded. He hoped soon to bring a detailed account of these observations upon pupal colour-adaptation before the Society.

Replying to Mr. Bateson's objections to the interpretation of the colour-susceptibility of the pupæ of *Pieris napi* as of protective value, he considered that it was in every way probable that the larvæ wandered before pupation (as those of allied species were known to do) and that their power of becoming green was of value when they were fixed to grasses or other plants which remain green through the winter. Even if all such green surfaces were covered up with snow in the more northern part of the range of the species, this would not be the case for the whole of the winter pupal period, nor would it hold good for other parts of the range. As to the objection that the results obtained with bred pupæ were not invariably consistent, in his experience the more completely the experiment was conducted with this sole object in view, the more uniform and convincing was the result.

Furthermore, the conditions of even the most carefully conducted experiments differed in many respects from those which obtained in nature. The proof required by those who objected to an interpretation based on natural selection was the discovery *in nature* of the exceptions noted in their experiments—that of light green pupæ of *P. napi* or *P. rapæ* or the golden or green pupæ of *Vanessæ* upon grey stone, or the dark forms of all these upon leaves.

Although some of these pupæ had been often observed in one or both situations he had not heard of any single exception to the rule; and if they occurred they must be excessively rare.

Mr. G. H. Verrall read a paper on "Syrphidæ collected by Colonel Yerbury at Aden," the specimens being exhibited by Colonel Yerbury.

Papers were communicated by Mr. G. C. Champion on "The Clavicorn Coleoptera of St. Vincent, Grenada, and the Grenadines," based on the determinations of M. Grouvelle; and by the Rev. T. A. Marshall on "The British Braconidæ, Part VIII."

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November 2nd, 1898.

Mr. G. H. VERRALL, Vice-President, in the Chair.

Election of a Fellow.

Mr. AMBROSE QUAIL, of Palmerston North, New Zealand, was elected a Fellow of the Society.

Exhibitions.

Mr. MERRIFIELD exhibited some *Melitæa aurinia* from Touraine forced and cooled as pupæ, the latter being much the darker and more strongly marked, some *Euchloe cardamines* from Sussex, those cooled having the apices of the wings darker and the discal spots smaller than those which have been forced, and some *Colias edusa* from eggs laid by two normal females taken in Savoy, two out of the five reared being of the var. *helice*; the marginal border of one male, which had been forced, was very pale and much suffused with long yellow scales. He also showed four *Papilio machaon*; two of them forced as pupæ, had their dark parts very pale and their tails long and slender, the two which had been cooled having the dark parts much extended in area and darkened in hue, their tails being short and broad. These results, which were to be obtained with winter as well as summer pupæ, corresponded with those previously obtained by Dr. Standfuss.

Mr. J. J. WALKER exhibited two winter nests of *Porthesia chrysorrhœa* from the Isle of Sheppey, where the species had lately become very common.

Dr. MASON exhibited a Buprestid larva found among Baltic timber at Burton-on-Trent. This had been among wood in a box since the beginning of July last, and there was scarcely a trace of frass. Marsham had recorded the escape of a larva of *Buprestis splendens* from the wood of a desk in the Guildhall, which had stood there for more than twenty years (Trans. Linn. Soc., x). It is probable that the growth is extraordinarily slow and consequently that the larva can maintain life for very long periods in most unfavourable conditions.

Mr. BLANDFORD called attention to similar cases which he

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had brought before the Society. It appeared likely to him, from what was known about such insects as *Callidium variabile*, which was occasionally bred from dry wood at long intervals, that these species were not abnormally slow-growing under normal conditions, but became so in dry timber in which they probably sustained life with difficulty, especially when the outside of the wood was varnished.

Mr. WATERHOUSE exhibited for Mr. G. W. Kirkaldy living examples in various stages of a *Caryoborus* in nuts of *Attalea funifera* from Brazil. Elditt had described the attacks of an allied species upon the seeds of *Cassia fistula*.

Mr. TUTT exhibited for Dr. Chapman a series of *Zygæna exulans* from Finmark and discussed the differences between them and the Scotch form.

Papers.

Papers were communicated by Mr. W. F. H. BLANDFORD "On some Oriental Scolytidæ of Economic importance with Descriptions of five new Species" and by Mr. VAN DER WULP (through Colonel Yerbury) on "Asilidæ from Aden and its neighbourhood."

November 16th, 1898.

Mr. R. TRIMEN, F.R.S., President, in the Chair.

Election of Fellows.

Dr. A. L. BENNETT, Mission Protestante, Libreville, French Congo; Mr. J. G. McH. GORDON and Mr. R. S. G. McH. GORDON, of Corsemalzie, Whauphill, Wigtonshire; Mr. J. A. KERSHAW, of Morton Banks, Lewisham Road, Windsor, Melbourne, Victoria; Mr. A. G. LETHBRIDGE, of Glynde Place, Lewes; Mr. W. J. LUCAS, B.A., of 278, King's Road, Kingston-on-Thames; Mr. R. H. RELTON, c/o Perkins and Co., Ltd., Brisbane, Queensland, and Dr. A. J. TURNER, of Wickham Terrace, Brisbane, Queensland, were elected Fellows of the Society.

Exhibitions.

Mr. TUTT showed, for Mr. Herbert Williams, a series of specimens of *Pararge egeria* bred from eggs laid on July 27,

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1892, and hatched on August 7. Of those bred, one attained the perfect state by the 19th September. The remaining pupæ were divided into batches, one lot being subjected to varying high temperatures indoors, and consequently being forced out in November and December, and the other, consisting of eight pupæ, being placed out of doors exposed to the full cold of the winter. These latter emerged during the first nine days of April. A certain amount of variation existed between the examples; those which emerged in November and December of the same year showed marked darkening of the hindmargin of the underside of the hindwings, and were of a greyer colour than those which appeared in the spring, the undersides of the latter being of a warmer brown coloration.

Mr. Tutt also exhibited the whole of a batch of fifty specimens of *Amphidasys betularia* bred by Mr. Williams from ova deposited by a female of normal type captured in Essex, the male parent being therefore unknown. The progeny ranged from a colour rather lighter than that of the normal form to a blackish tint almost equal to that of var. *doubledayaria*; all intergrades were represented without sign of discontinuity.

Mr. Bateson said that the series of *P. egeria* was especially interesting to him, as he had for some years been engaged in experimenting with varieties of that species. The specimens exhibited were all from New Forest eggs. Some had been warmed as pupæ, while others had been exposed to the winter of 1892–93. The butterflies resulting from both lots were quite distinct from the ordinary English form of the species, having the yellow spots of the more fulvous colour characteristic of the variety found in Brittany. This form is almost exactly intermediate between *P. egeria* of the south of Europe and the English var. *egeriades*. Curiously enough, the specimens which had been exposed to winter were on the whole the warmest in colour. As regards the yellow of the upper side, any of these latter might have been taken for Breton specimens. The undersides were, however, peculiar, and unlike any specimens he had previously seen. All the eight were alike in having a dark area crossing the wings at about the second third. Beyond this dark area the colour was

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unusually light. A curious appearance of contrast resulted. These specimens proved that a form differing little from the Breton type might arise as a sudden variation from the English type.

The series of *A. betularia* was of considerable interest. The result of crossing *betularia* with the var. *doubledayaria* had previously been the production of specimens of type and variety sharply distinct from each other. In the present case a single female had produced a number of type specimens, a few nearly as dark as *doubledayaria*, and several intermediates. The father was unknown, but not improbably it may have been *doubledayaria*. Cases of this kind showed that the degree of discontinuity occurring in crosses between varieties cannot be determined without many experiments with different strains. Between these two varieties there was reason to believe sharp discontinuity was the rule. In this family the discontinuity was only partial. Most of the specimens belonged either to *betularia* or to *doubledayaria*, but a few of each sex were truly intermediate. He hoped a full account of these insects would be published.

Mr. H. J. Elwes gave an account of a journey undertaken by himself in the summer of the present year to the Altai mountains of Siberia, partly for sport and partly to investigate the distribution of Lepidoptera in that region, and to discover if possible a line of demarcation between the Eastern and Western Palæarctic, or, as it is now more properly termed, Holarctic region. He exhibited a very fine series of Lepidoptera, taken by himself in the Altai, and including about 140 species of butterflies and 80 of moths, many of which had not previously been recorded from Western Asia, and traced his journey on a large scale map. The only entomologists who had previously collected in this region, so far as he knew, were Kindermann in 1851 and 1852 on the Buchtarma river, and Ruckbeil who more recently spent three seasons in the same part of the mountains. Their collections were both of a much more typical European character than those made by himself, which included a number of species previously known only from the Upper Amur region and Eastern Siberia, as well as several Lapland and Arctic species, amongst which *Erebia*

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rossi, Cust. (= *ero*, Brem.) *Melitæa iduna*, Dalm. and *Arctia thulea*, Dalm. were the most remarkable. Of the latter insect he believed two specimens only had been previously taken, the type in Lapland and a second in Eastern Siberia. He described the character of the country and the climate, which is a very peculiar one; dry and hot during the extremely short summer, but subject at elevations above 6,000 feet, where most of his time was spent, to thunder- and snowstorms almost daily. The total number of butterflies now recorded from the region stood at about 180, a larger number than had ever been taken in a similar area in Northern Asia, as far as he knew. The Heterocera of course represented but a very small part of what would be found in the Altai by a collector who could give up his whole time to it, but as the time during which he had been able to collect was little more than a month, during which he had ridden nearly 1,000 miles, and the nights when clear were almost always frosty above 7,000 feet, he had been able to do no night work. There were very few novelties in the collection, but when thoroughly worked out, which he hoped to do in time for publication in an early part of next year's Transactions, he thought the list would be a valuable contribution to our scanty knowledge of the Lepidoptera of Siberia. He concluded by saying that now that the Siberian railway made the journey as far as Irkutsk a comparatively short and easy one, he hoped other English naturalists would visit this very interesting country, especially as every facility was given by the Russian government to bonâ fide scientific travellers provided with proper credentials.

Mr. Bateson congratulated Mr. Elwes on the great success of his expedition. The collection was full of interesting features. The presence of so many forms recalling N. American and Arctic faunas was clearly a point of great importance. In this connexion he called attention to a specimen of *P. napi* ♀, having the brown veining on the upper side almost as much marked as in the var. *bryoniæ* of the European Alps. The ground colour was nevertheless white, instead of yellow as it is in *bryoniæ*. He had lately received a specimen taken by Mr. Gayner at Lulea in the N. of Sweden, which was practically identical with that brought by Mr. Elwes from the Altai.

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Paper.

Dr. A. G. Butler communicated a paper "On some new species of African Pierinæ in the collection of the British Museum, with notes on seasonal forms of *Belenois*."

December 7th, 1898.

Mr. R. Trimen, F.R.S., President, in the Chair.

Election of Fellows.

Monsieur Léon Candèze, of 64, Rue de l'Ouest, Liége; Mr. C. L. B. Stares, M.R.C.S., L.R.C.P., of the Infirmary, Wandsworth, S.W.; Mr. A. Russell, of The Limes, Southend, Catford; and Mr. C. B. Holman Hunt, of Meddecombra, Watagoda, Ceylon, were elected Fellows of the Society.

Exhibitions.

Mr. McLachlan exhibited a series of specimens of the Neuropterous genus *Tetracanthagyna*, de Selys, including a pair of a new species from Borneo, which was the largest known of all recent dragon-flies, though it was slightly exceeded in wing-area by the much more slender *Megaloprepus cærulatus*, a common Central-American species.

Mr. A. H. Jones showed about sixty species of Lepidoptera, taken round electric lights at Zermatt, in August. Among the more interesting were *Crateronyx taraxaci*, *Ellopia fasciaria*, ab. *prasinaria*, two ♀, one bright green, the other an intermediate form, *Cidaria cyanata*, a light form of *C. variata*, a large and light form of *C. populata*, *Agrotis grisescens*, *A. decora*, *A. candelarum*, and a large form of *A. lucernea*, *Plusia illustris*, and a series of *P. argenteum*, *Hadena maillardi*, a light form of *Dianthœcia cæsia*, and a fine black variety of *Polia flavicincta*.

Dr. Dixey exhibited a series of Pierid butterflies from the Neotropical region to show the existence among them of seasonal forms. The species shown were *Parura rurina*, Feld., ♂; *P. neocypris*, Hübn., ♂; *Phœbis argante*, Fabr., ♂, ♀; *P. agarithe*, Boisd., ♂; *Callidryas sennæ*, Linn., ♂, ♀; *C. philea*, Linn., ♂. In each case three specimens

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were shown, exemplifying the "wet season," "dry season," and "intermediate" forms of the species, and selected from the Hope Collection by permission of Professor Poulton.

With reference to the exhibit, Dr. Dixey remarked that although direct evidence as to the seasonal changes in these Neotropical species was at present scanty, the indirect evidence was strong; inasmuch as the range of variation here shown was analogous with that existing in certain African and Oriental species, whose seasonal relations had been put on a firm basis by the work of Watson, Barker, Marshall, and others. In every one of the present instances the "wet season" form tended to be more deeply coloured, and to have its markings on the underside more fully developed; while the "dry season" form was usually smaller, had its forewings more sharply pointed, and was nearly or entirely devoid of markings on the underside. He stated further that where evidence of the date of capture existed, it accorded very fairly with the supposition that these variations bore relation to seasonal conditions, though of course more data of this kind were much needed. He had selected the specimens of each species so far as possible from the same locality, endeavouring thus to meet the possible objection that these varieties, several of which had been described as distinct species, might have a local rather than a seasonal significance. He added that by an "intermediate" form he meant simply one that came somewhere between the other two—not necessarily half-way. He was accustomed to use the term in a general sense as equivalent to the German "Zwischenform," not as conveying the idea of an arithmetical mean (Mittelform).

The PRESIDENT observed that the exhibit was of special interest, as affording the first recorded evidence of the existence of seasonal dimorphism in Neotropical butterflies.

Mr. G. T. PORRITT exhibited an extraordinary variety of *Bombyx quercus*, bred in June last by Mr. W. Tunstall, from a larva found near Huddersfield. The specimen was a female of deep chocolate colour, with the band very faintly traced in dark olive. He also showed a yellow variety of *Anchocelis rufina* from Wharncliffe Woods, West Yorkshire.

Dr. CHAPMAN, MR. LLOYD, and Mr. NICHOLSON exhibited

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butterflies taken by them in Norway from June 20 to July 22, during the past summer at Sæterstöen and Bolkesjö, about 60° 12′ N., and Bossekop, 69° 50′ N. It appeared from the exhibit that it would have been better to collect a month or so earlier, especially in the more northern locality visited. It was also seen that northern races of butterflies and moths were apt to differ a little from those of the mid-European fauna, but that various named varieties supposed to be characteristic boreal representatives of their species, were often rather aberrations, and not the dominant northern type. This was the case in *Vanessa urticæ*, *Erebia medusa*, *E. ligea*, etc.; on the other hand, as in *Brenthis selene*, var. *hela*, the entire local race was of the variety.

The series exhibited comprised the following species:—

1. *Colias palæno*, from Sæterstöen and Bossekop. The northern specimens with distinctly narrower borders than the southern ones.

2. *Vanessa urticæ*. About half the specimens bred were shown, the larvæ from Kaafiord near Bossekop. Many specimens resembled English ones, though the average was much darker than that of English examples. One or two approached var. *polaris*, which was not actually represented. *Polaris* appeared therefore not to be a northern race, but an aberrant form no doubt more frequent there than in England.

3. *Brenthis aphirape*, chiefly var. *ossianus*, Herbst. Variable in intensity of markings and the amount of silvering beneath, but presenting no marked aberrations, such as are described by Meves (Entom. Tidskrift, 1894).

4. *Œneis jutta*, Sæterstöen. A large race exceeding 2½ inches in expanse and varying from a form without spots to one with six spots on the forewings and four on the hindwings, in some with a trace of white pupils.

5. *Erebia embla* from Sæterstöen, showing considerable variation, but no extreme examples.

6. *Erebia ligea*. Four series respectively from Kaafiord, 69° 50′ N., July 20; Tromsö, 69° 40′ N., July 24; Bodö, 67° 15′ N., July 25; Trondjhem, 63° 25′ N., July 27.

The Tromsö specimen very worn, those from Trondjhem very fresh, though taken 3 days later. The Kaafiord

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examples smaller than the others, some of them not larger than the smaller form of *ocellaris*, but with no sign of the red band diminishing; the females differing little from the males in the colouring of the underside. This was the case also with those from Tromsö, but in a less degree, and even the Trondjhem example had no approach to the pale banding of Central-European females.

7. *Erebia medusa*, var. *polaris*. Some approaching typical *medusa*, and only a few near *polaris* as described, which is therefore an aberration rather than a constant variety. The whole series however with a different facies from that of an equal series of Central-European specimens, and, unlike the southern form, entirely without Asiatic neuration.

Dr. CHAPMAN remarked that *Erebia embla* as taken at Sæterstöen and *E. disa* as taken at Bossekop, had all the characters of distinct species. The male appendages were very constant in each form, and as described in the Transactions for the present year, p. 228. In *E. embla* the spines were confined to the head, in *E. disa* they extended along the whole of the neck; the appendages were also definitely smaller (5 to 6) and of a darker (denser?) chitin.

The *ova* were also distinct as follows :—

	E. embla (three eggs).	*E. disa* (one egg.)
Height	1·16 millim.	1·00 millim.
Width	·94 ,, ...	·85 ,,
Greatest breadth	a little above middle.	below middle, tapering upwards.
Ribs	about 30, approaching the apex, straight and regular.	47 or more, irregular, breaking up low down, reuniting above, more beaded.
Colour	Reddish-brown, maculate.	Darker, reticulate.

Papers.

Papers were contributed by Mr. R. MCLACHLAN, entitled, "Considerations on the genus *Tetracanthagyna*;" by Mr. M. BURR, entitled, "A List of Rumanian Orthoptera;" and by Mr. J. H. LEECH on "Lepidoptera Heterocera from China, Japan, and Corea, Part II."

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ANNUAL MEETING.

January 18th, 1899.

Mr. ROLAND TRIMEN, F.R.S., F.L.S., &c., President, in the Chair.

Mr. A. HUGH JONES, one of the Auditors, read the Treasurer's Balance Sheet, showing a balance of £86 4*s.* 2*d.* in favour of the Society.

Mr. W. F. H. BLANDFORD, one of the Secretaries, read the following

Report of the Council.

The Society is to be congratulated on the close of a Session marked by a large increase in the number of Fellows and by unusual prosperity.

During 1898 it has indeed lost by death three Ordinary Fellows—Mr. Stephen Barton, Dr. Ernest Candèze and Mr. Osbert Salvin, F.R.S., F.L.S.,—and by resignation, eight Ordinary Fellows.

On the other hand, three Honorary Fellows—Professor B. Grassi, M. Hippolyte Lucas and Dr. August Weismann—and thirty-four Ordinary Fellows have been elected.

This is by far the largest number of additions to its ranks in any one year, except in 1886, when, owing to the grant of the Society's Charter, 35 new Fellows were elected and 21 Subscribers were admitted as Fellows, the position of a Subscriber having been abolished.

As in previous years, the Society is indebted to one or two Fellows for unremitting and successful endeavours to increase its members; it is, however, noteworthy that out of 18 Fellows elected since the summer vacation, 9 are resident outside the British Isles.

The Society now consists of 12 Honorary, 53 Life, and 359 Fellows liable for the Annual Contribution, making in all 424 Fellows, or 26 more than last year.

The Transactions for the year form a volume of 444 pages, as against 434 pages in 1897, and consist of twenty-two Memoirs. These have been contributed by the following

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authors: Mr. Walter F. H. Blandford; Mr. Malcolm Burr; Dr. Arthur G. Butler; Mr. George Champion (3 papers); Dr. Thomas A. Chapman (3 papers); Mr. Henry J. Elwes, F.R.S.; Mr. F. DuCane Godman, F.R.S., and the late Mr. Osbert Salvin, F.R.S.; Mr. E. Ernest Green and Mr. Malcolm Burr; Mr. George C. Griffiths; Sir George F. Hampson, Bart.; Mr. Martin Jacoby; the Rev. William F. Johnson and Mr. George H. Carpenter; Mr. John Henry Leech; Mr. Robert McLachlan, F.R.S.; Mr. Roland Trimen, F.R.S.; Mr. James W. Tutt; and Mr. George H. Verrall.

Of these Papers, 16 are descriptive, systematic or faunistic, and relate: four to Coleoptera, one to Diptera, one to Hemiptera, seven to Lepidoptera, two to Neuroptera, and one to Orthoptera. Of the remaining Papers, four deal with life-histories in Coleoptera, Lepidoptera (2) and Orthoptera; one deals with experimental breeding, and one with the morphology of the frenulum in Lepidoptera.

The Memoirs are illustrated by 19 plates, of which 3 are coloured.

The Society is indebted to Mr. F. D. Godman, F.R.S., for the cost of Plates II and III; to the West India Committee of the Royal Society and British Association for the cost of Plate XVII; to Mr. H. J. Elwes, F.R.S., and Dr. T. A. Chapman for a portion of the cost of Plates V–XVI; and to Mr. J. H. Leech for a portion of the cost of printing Paper XV.

The Journal of Proceedings, containing an account of, and notes on, Exhibitions and Discussions at the Meetings, extends, exclusive of the Report of the Annual Meeting, to 43 pages. This is of somewhat shorter length than usual, owing to several of the Meetings having yielded but little material for record. It need scarcely be pointed out that the remedy for this lies with those Fellows who attend the Meetings.

The most notable event of the year is the bequest to the Society, by the will of the late Mrs. H. T. Stainton, of such books from her late husband's library as were not already in the Society's possession. The bequest was made known in October, and the selection of books from the late Mr. Stainton's library, which included that formerly belonging to James

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Francis Stephens, occupied four days, and was carried out in accordance with the terms of the will by Mr. W. F. H. Blandford.

Although immediate possession was granted of the books selected, no exact statement can be made in the present Report of the number of works thus added to our shelves. Many of the books, being in immediate need of re-binding and repairs, were sent off for that purpose, and have not yet been all returned. Extensive alterations have been required in the Library, the shelves of which were already overstocked, to accommodate this addition, together with others received during the current year, including a donation of upwards of 150 books and pamphlets from Mr. W. F. H. Blandford.

It may, however, be assumed that the Stainton Bequest will add from 400 to 500 volumes to our shelves, together with a large number of pamphlets and "separata."

The extra accommodation required in the Library has been provided by a re-arrangement of bookcases and shelves, and the addition of two new bookcases, at a cost of over £40, which, together with other expenses attendant thereon, it is proposed to treat as a capital charge and to defray out of prospective Life-Compositions and other sources of adventitious income, so as not materially to interfere with the sum available for our Transactions and current expenditure.

In view of the additions which have been made to the Library, and the consequent diminution in utility of the Catalogue published in 1893, of which a large number of copies remain unsold, the Council have decided to issue, at as early a date as possible, a Supplementary Catalogue, to contain all additions made to the Library from 1893 up to the date of publication. It is hoped that this Supplementary Catalogue, in which the Stainton books will receive a distinctive mark, will meet, together with the remaining copies of the original Catalogue, with such a sale as to justify the expenditure incurred in its production.

The financial condition of the Society is thoroughly sound. The amount received for current subscriptions is the largest on record, and most of the other items of revenue show a satisfactory increase over last year. The sum spent for

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printing is less, and there has been a saving in the miscellaneous items grouped under Office Expenses. Two Life-Compositions were received during the year, and were invested in Consols; the amount so invested is now £581 18*s.* (= £588 9*s.* 11*d.* Consols). Owing to the increase in ordinary revenue, combined with liberal donations towards the cost of Papers published, and the decrease in expenditure, the balance in hand, which at the beginning of the year was only nominal, reached the large sum of £86 4*s.* 2*d.* at the end. Part of this has since been treated as a loan to the Capital Account, and expended on the new bookcases and repairs to existing ones, rendered necessary by the Staintonian bequest.

11, Chandos Street, Cavendish Square, W.
18*th January*, 1899.

The Balance Sheet and Report of the Council having been unanimously adopted, it was announced that no notice had been sent to the Secretaries proposing to substitute other names for those contained in the lists prepared by the Council. The following Fellows therefore constitute the Council for 1899:—Walter F. H. Blandford, M.A., F.Z.S.; George C. Champion, F.Z.S.; Thomas A. Chapman, M.D.; Horace St. J. K. Donisthorpe; the Rev. Canon W. W. Fowler, M.A., F.L.S.; Charles J. Gahan, M.A.; A. Hugh Jones; Robert McLachlan, F.R.S., F.L.S.; Frederic Merrifield; Edward Saunders, F.L.S.; Roland Trimen, F.R.S., F.L.S.; James W. Tutt; George Henry Verrall; James J. Walker, R.N., F.L.S.; and Charles O. Waterhouse.

The following are the Officers elected:—*President*, Mr. George Henry Verrall; *Treasurer*, Mr. Robert McLachlan; *Secretaries*, Mr. James J. Walker and Mr. Charles J. Gahan; *Librarian*, Mr. George C. Champion.

The Address of the retiring President, Mr. Roland Trimen, was then read on his behalf by Mr. Blandford, one of the Secretaries.

Professor Meldola, at its conclusion, proposed a vote of thanks to the President for his valuable and interesting

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Address, and for his services to the Society during his term of office. This was seconded by Mr. W. L. DISTANT, and carried by acclamation.

The PRESIDENT having acknowledged the vote, a vote of thanks to the Officers and Council was moved by Professor POULTON, seconded by Mr. H. J. ELWES, and supported by Mr. C. J. GAHAN. The vote having been carried, Mr. McLachlan and the retiring Secretaries, Mr. Merrifield and Mr. Blandford, spoke in acknowledgment.

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ENTOMOLOGICAL SOCIETY OF LONDON.

Balance Sheet for the Year 1898.

Receipts.	£	s.	d.	Payments.	£	s.	d.
Balance in hand, 1st Jan., 1898	1	0	1	Printing Transactions, &c.	177	3	7
Subscriptions for 1898 ...	319	4	0	Plates, &c.	67	10	9
Arrears	17	17	0	Rent and Office Expenses	156	10	10
Admission Fees	44	2	0	Books and Binding	16	13	7
Donations	32	12	0	Investment in Consols ...	31	10	0
Sales of Transactions, &c.	58	17	3	Subscriptions in advance carried to 1899	11	11	0
Do. of Surplus Books ...	8	8	0	Balance	86	4	2
Interest on Investments:—							
Consols £15 3 7							
Westwood Bequest 6 19 0							
	22	2	7				
Life Compositions	31	10	0				
Subscriptions in advance..	11	11	0				
	£547	3	11		£547	3	11

ASSETS.

Balance (per contra) £86 4 2

Subscriptions in arrear considered good (say) 21 0 0

Investments:—

Cost of £588 9*s.* 11*d.* Consols ... ... £581 18*s.* 0*d.*

Cost of £239 12*s.* 4*d.* Birmingham Corporation 3 per cent. Stock (Westwood Bequest) £250.

LIABILITY.

(Since discharged.)

Cost of New Bookcases and Alterations to Old Ones, £40 14*s.* 0*d.*

Robert McLachlan,
Treasurer.

Audited and found correct,
A. Hugh Jones.
Robt. Adkin.
Louis B. Prout.
Walter F. H. Blandford.

11th January, 1899.

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THE PRESIDENT'S ADDRESS.

GENTLEMEN,

It is not necessary for me to say much in reference to the highly satisfactory Report of the Council, which shows that the promising prospect of the Society's affairs at the beginning of 1898 has been amply verified by the year's experience. Our meetings have been well attended; thirty-seven new Fellows have been elected; and our finances show a phenomenal balance in hand.

Our Library has also been especially favoured during the year. By the bequest of the late Mrs. H. T. Stainton, widow of our former President, the highly-distinguished lepidopterist, the Society was entitled to select from her late husband's library—which included the well-known Stephensian collection—such entomological works as were not previously in its possession, and it has thus acquired a large number of books and separate memoirs, including copies of many older works now of great rarity and value. From Mr. W. F. H. Blandford, who has devoted much time and attention to the development of the Library, we have received a most welcome donation of books and memoirs relating principally to economic entomology—a branch of the Science hitherto imperfectly represented on our book-shelves.

In July the third annual visit of the Officers and Council to Oxford, at the invitation of the Hope Professor of Zoology, took place, and was marked by renewed hospitality on the part of Prof. Poulton and other distinguished resident members of the University. A very interesting time was spent in the Hope Department, where many advances have been made in the increase, classification, and cabinet arrangement of the

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entomological collections. One notable feature that I found especially pleasing was the attention bestowed on the separate arrangement of groups of insects illustrating the phenomena of mimicry and warning colouration, and of seasonal dimorphism. So completely had this improvement been considered, that it extended to the including of specimens of Lepidoptera whose mutilated wings gave evidence of the attacks of birds and other insect-eaters—the first instance known to me of the recognition by any Museum of the value of such injured examples, which have everywhere been rejected as worthless. Prof. Poulton has also succeeded in securing several groups of tropical and subtropical species, exhibiting mimetic resemblance or common warning colours, captured in one locality and on the same day, and thus in initiating an invaluable series in evidence of the actual companionship in life of their wonderfully adapted forms.

In resigning the Presidential Chair, I desire in the first place to thank the Society, and more particularly my colleagues on the Council, for much consideration extended to me on the too frequent occasions when my health obliged me to devolve the duties of Chairman on one of the Vice-Presidents. More especially am I indebted to our Secretary, Mr. W. F. H. Blandford, who has most kindly aided me by preparing the Obituary Notices, and also by undertaking to read my Address at both the Annual Meetings at which I have had the honour of presiding. Gratifying as it is to me to recognise that the Society has made more than average progress during my two years' tenure of the Chair, I am well aware that I have personally been able to do very little to promote this prosperity, and that credit for it is mainly due to the unremitting attention given to our affairs by the Treasurer and Secretaries. Our experienced Treasurer, Mr. McLachlan, I am glad to say, maintains his post as guardian of our finances; but it is with sincere regret that we have received the resignation of both our Secretaries, Mr. Blandford and Mr. Merrifield, who have rendered such able service for the last two years. The withdrawal from office of these gentlemen will not be surprising to any one who, like myself, has been Secretary to a learned Society, and knows how large

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an inroad upon one's time and energies is inseparable from the efficient discharge of the duties of that position. I have for some time past thought that the Society, considering its growth and more established status of late years, and the consequent increase of the work attendant on its proper administration, would do well to follow the example of the other Chartered Societies devoted to Natural Science, by appointing a paid Assistant-Secretary to conduct the ordinary routine business under the direction of the Secretaries. In Mr. J. J. Walker and Mr. C. J. Gahan, who have accepted election as Secretaries, we are fortunate in obtaining officers whose proved entomological attainments are ample warrant for the maintenance of that devotion to the Society's interests which has marked the service of the retiring Secretaries.

I join with you in welcoming, as my successor in the Presidency, Mr. George Henry Verrall, who is well known to us all as an entomologist, and specially as a dipterist, of high standing, and also as one of our oldest Members and Fellows, who has repeatedly served on the Council and as Vice-President. Mr. Verrall has in every way shown unfailing interest in the well-being of the Society, and has done much to promote it both scientifically and socially; and it will certainly not be his fault if the Society does not flourish during his occupancy of the Chair.

OBITUARY.

Although numerically our losses by death during 1898 have been small, it is a matter of great regret to miss from our roll of Fellows—and in one case from our Council and Society Meetings—two such highly-distinguished entomologists as Osbert Salvin and Ernest Candèze. Among the few deaths outside the limits of our Society, special mention should be made of the late Joseph A. Lintner, State Entomologist of New York; William M. Maskell, a notable authority on the Coccidæ; and James Thomson, the well-known coleopterist, of Paris.

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Osbert Salvin, F.R.S., F.L.S., &c., was the second and only surviving son of the distinguished architect, Mr. Anthony Salvin. Born at Finchley in 1835, he was educated at Westminster School, and later at Trinity Hall, Cambridge, of which he was elected an Honorary Fellow in 1897. He graduated in 1857, and immediately afterwards proceeded to Tunis and Algeria for the purposes of natural-history exploration, in company with Mr. W. H. Hudleston and Mr. (now Canon) Tristram. In the autumn of the same year he began his long and intimate connexion with Central-American natural history by visiting Guatemala, where he remained till the middle of 1858. In the following year he paid a second visit to Central America, and in 1861 he again revisited it in company with Mr. F. DuCane Godman, since that time his constant fellow-worker. After his marriage in 1865 he made one further journey to Central America in company with his wife. His attention was at this time more particularly directed to Ornithology, on which he became one of the leading British authorities. He was one of the founders of the *Ibis*, the third series of which he edited; he was the author of the volumes on the Humming-birds and Petrels in the British Museum *Catalogue of Birds*; and from 1874 till 1883, when on his father's death he took up his residence at Hawksfold, near Haslemere, he filled the office of Strickland Curator at Cambridge, also publishing a catalogue of the Ornithological collection in his charge.

As an entomologist, Osbert Salvin's name will chiefly and always be remembered, in association with that of Mr. F. D. Godman, for the important part he took in the inception, preparation, and issue of that great work the *Biologia Centrali-Americana*, and more particularly for his joint authorship of that portion of it which monographed the extremely rich butterfly-fauna of the region between Mexico and Panama. All his work, whether ornithological or entomological, bore the stamp of thoroughness, and gave testimony to the great extent and exactness of his knowledge, no less than to his soundness of judgment. The latter quality was, indeed, a conspicuous feature of his character in all aspects, and caused him to be always in request on the Councils and Committees

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of the various scientific Societies (Royal, Linnean, Zoological, and Entomological) of which he was a Fellow. Those who have served with him on such Boards will recall his quiet, kindly ways, enlivened by a pleasant sense of humour, and how often his brief suggestions exactly met a difficulty, or indicated the best course to adopt. But for his weak health during recent years, he would long since have taken the chair as President of our Society. In private life he was a kind and constant friend, and to all his scientific acquaintances most amiable and obliging, readily placing at their disposal both his great knowledge and his unrivalled collections.

Ernest Charles Auguste Candèze, M.D., F.E.S., was born at Liége on the 27th of February, 1827, and studied medicine there and at Paris. He became assistant medical officer to, and subsequently director of, a large asylum at Glain, near Liége, a post which he retained until a few years ago.

In entomology he was a pupil of Lacordaire, under whose guidance and supervision, and in collaboration with a fellow-pupil, F. Chapuis, he published in 1853 his first work, a Catalogue of Coleopterous Larvæ, known up to that date, and still of much utility. It is probable that Lacordaire, in his solicitude for the study of the more neglected families of Coleoptera, induced Chapuis to take up the Phytophaga and Xylophaga, and Candèze to devote himself to the Elateridæ, a family with which his name is permanently associated. He formed an extensive collection of Elateridæ, which included series from the Dejean and other old collections, and served as the groundwork of his monograph of the family, published in 1857, 1859 and 1860, in three volumes. This collection was purchased by the late Mr. E. W. Janson, and was subsequently acquired by Mr. F. D. Godman for the British Museum. Candèze formed more than one subsequent collection, and published a large number of papers on the family, chiefly in the "Annales" of the Belgian Entomological Society, of which he was one of the founders. He also compiled a catalogue of the species described subsequently to that of Gemminger and Von Harold. Dr. Candèze was a man of much culture and many accomplishments. He joined this Society in 1860.

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Stephen Barton, F.E.S., who died on November 17th, 1898, aged 78 years, was one of the oldest Fellows of this Society, which he joined in 1865. He visited Australia in 1852, where he made extensive collections of Coleoptera, including many new species, which were described on his return to England by his friend, Henry Walter Bates and other authors. It was proposed that Barton should join Bates on the Amazons; but the arrangement came to nothing, and Barton settled in Bristol, where he formed large collections of insects, chiefly Coleoptera. He was for thirty years President of the Entomological Section of the Bristol Naturalists' Society. He never contributed to the publications of this Society, and though an excellent entomologist, his name is probably little known to the present generation of Fellows, except those who reside in the West of England.

The deaths of the following distinguished entomologists, not Fellows of this Society, have been recorded since the last preceding Annual Meeting :—

James Thomson, an American by birth, who passed most of his life in Paris, formed a large and valuable collection of the more striking Coleoptera. He published numerous papers on the insects of his collection, chiefly on Longicornia, from 1856 onwards in the "Annales" of the French Entomological Society and other periodicals, and his name must be very familiar to any one who has occasion to consult French monographic works on Coleoptera, published between 1860 and 1880. Some years ago he parted with his collections to M. René Oberthür, and since that time his interest in entomology largely ceased. He was a member of this Society from 1856 to 1888. It should not be forgotten that he married a sister of Charles Stewart Parnell.

William Miles Maskell, late Registrar of the University of New Zealand, was born in Hampshire, and, after serving for a short time in the Army, went to New Zealand in 1860. His earlier scientific work was done in connexion with microscopy, but he afterwards devoted himself to the study of Aleurodidæ, Psyllidæ, and especially Coccidæ, on the New Zealand species of which he was the one established authority, though he subsequently investigated Australian and Asiatic

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species. His published entomological papers began in 1879, and appeared mainly in the "Transactions of the New Zealand Institute." In 1887 he published "An Account of the Insects noxious to Agriculture and Plants in New Zealand. The Scale insects (Coccidæ)," a work of considerable utility and value. His researches on this family of insects have materially contributed to the great development of knowledge of the distribution and economy of Scale insects which has taken place during the last fifteen years.

Jules Migneaux, the well-known French entomological artist; Dr. Joseph Albert Lintner, State Entomologist for New York, and one of the leading American economic entomologists; Martial Jean Maurice Noualhier, a capable hemipterist, specially interested in the Hydrocores, and Prof. Mariano de la Paz Graëlls, one of the leading Spanish entomologists, have also died during 1898.

SEASONAL DIMORPHISM IN LEPIDOPTERA.

I have thought this to be a suitable subject for my Address, because it is not only of high interest as a remarkable phase of Variation, but has also of late years been brought prominently to notice by the researches of two groups of entomological observers; firstly, those who, like the pioneers, G. Dorfmeister, W. H. Edwards and August Weismann, have experimentally studied the effects of high and low temperatures artificially applied to lepidopterous pupæ of European or North American species; and secondly, those who have noted the seasonal changes in butterflies occurring naturally in various tropical and subtropical regions, and have in some cases reared one seasonal form of a species from ova deposited by the other. The earlier temperature experiments in Europe and North America were long in advance of the observations on seasonal dimorphism in tropical countries, the latter indeed being the natural outcome of the former. It may prove not uninteresting if I briefly pass under review the published memoirs relating to both sets of observations, but, as regards the temperature

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experiments, limiting my remarks almost exclusively to those relating to seasonally-dimorphic species.

No doubt many of us remember with what interest we welcomed Weismann's able treatise * published twenty-three years ago, whether in the original or in the English edition (translated by Prof. Meldola) issued in 1882. The cases known to Weismann, and described in this memoir, were not numerous; he calls special attention to six European cases (*Araschnia levana*, *Lycæna amyntas*, *L. agestis*, *Chrysophanus phlæas*, *Pieris napi*, and *Euchloe belia*), and to three North American (*Phyciodes tharos*, *Grapta interrogationis* and *Papilio ajax*), the latter known to science through the investigations of W. H. Edwards, the well-known monographer of the butterflies of North America, whose experiments and results † are re-published with additions as Appendix II. to Weismann's essay. In the phenomenon of seasonal dimorphism Weismann recognised, as two prominent factors in the possible *direct* influence of the varying external conditions of life, temperature and duration of the pupal period; and his experiments with *Araschnia levana* and *Pieris napi* were accordingly carried on with the view of ascertaining whether the dimorphism exhibited by those species could be traced to the direct action of those factors. In the case of *A. levana*, he first subjected the pupæ obtained from eggs laid by the winter form, immediately after pupation, to artificial low temperatures, and the result was that, by exposure to temperature of 0°—1° R. for four weeks, three-fourths of the pupæ produced, not the summer form *prorsa*—as under natural conditions they would have done—but the intermediate form *porima* (extremely rare in nature), three of these being very nearly the pure winter form *levana*. Increasing the period of exposure to cold to eight weeks did not materially add to the extent to which the summer form was lost and the winter form substituted. The converse experiment, frequently repeated, consisted in placing in a hot-house (temperature

* "Studien zur Descendenz-Theorie. I. Ueber den Saison-Dimorphismus der Schmetterlinge," 1875.

† Canadian Entomologist, vii, p. 236 (1875), and ix, p. 69 (1879).

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12°—24° R.) immediately after pupation, pupæ from eggs laid by the August brood of the summer form, *prorsa*; but here the artificial temperature had little or no effect, all, or nearly all, the pupæ hibernating, and emerging in the following spring as the pure winter form *levana*. This latter result led the author to the opinion that cold and warmth could not be the *immediate* causes of a pupa emerging in the *prorsa* or *levana* form; and that the explanation of the facts seemed to be (*a*) that the winter form *levana* is the original type of the species, seeing that it was found possible to make many specimens of the summer form *prorsa* revert to it by means of cold, whereas the converse change could not be effected; and (*b*) that the species originally existed in the glacial period as a single-brooded and monomorphic butterfly, and only became double-brooded and gradually developed the *prorsa* form as warmth of climate increased.

With *Pieris napi*, Weismann found the pupæ from eggs laid by the winter form much more responsive to the action of cold (applied immediately after pupation and continued for three months) than those of *A. levana*, by far the larger number emerging as the pure winter form when transferred to a hot-house, and the remainder (which resisted forcing and hibernated) all producing the same form in the following spring. The converse experiment was not tried with the pupæ of ordinary *P. napi*, but with those of the Alpine and Polar variety, *bryoniæ*, but the result was in accordance with that of the corresponding experiment in the case of *A. levana* —the application of heat had no transforming effect, and all the butterflies emerged as pure *bryoniæ*. Weismann was thus led to regard the single-brooded variety *bryoniæ* as the original form of the species from the glacial period, and *napi* in its winter and summer forms as gradually produced under increasing climatic warmth.

The experiments conducted with so much skill and perseverance by W. H. Edwards with the North-American *Papilio ajax* and *Phyciodes tharos* yielded much the same results as those obtained by Weismann in Europe. In the complicated case of *P. ajax*—where the winter form presents itself in the two differing generations known as *walshii* and

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telamonides, and the summer form known as *marcellus* appears in three similar generations—Mr. Edwards, by the application of ice for a period of two months, found that fifty pupæ reared from eggs laid by the second generation of the winter form (*telamonides*), which under natural conditions would nearly all have given the summer form *marcellus*, produced no fewer than twenty-two *telamonides*, one specimen intermediate between *telamonides* and *walshii*, eight examples intermediate between *telamonides* and *marcellus*, but nearer to the former, eight intermediate between the same forms but nearer to the latter, and only eleven true *marcellus*. It should be observed, however, that there is a difference in the shape of the wings between the winter and summer forms of this *Papilio*, and that the strong innate tendency of the progeny of the winter form to assume the summer form was evidenced in the fact that all the butterflies from the refrigerated pupæ which had the markings of *telamonides* or of *walshii* yet bore the shape of *marcellus*.

The extreme variability of *Phyciodes tharos* renders it difficult to follow the details of Edwards' experiments with the various broods from different districts, but it is clear that, as in the case of *P. ajax*, the application of cold induced the summer form to revert to the winter form (*marcia*). I do not gather that the converse experiment was tried with this butterfly; but it was attempted to a certain extent with *Papilio ajax*, whose hibernating pupæ were subjected to a moderate degree of heat during some months, for several years in succession, without any change being effected in the resulting winter form of the butterfly. The evidence in the case of *Grapta interrogationis* has a different bearing on the subject, seeing that this species does not hibernate as pupa but as imago, and that therefore there is not, strictly speaking, any "winter" form; but it would appear that the first of the four broods in the year consists wholly of the form named *umbrosa* and the fourth of the form named *fabricii*, while the intervening second and third broods are each composed of both forms.

Only brief reference is made by Weismann to the experi-

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ments on *Araschnia levana* made by G. Dorfmeister,* an account of which was published as far back as 1864, but a full *résumé* of them has been given by the late Prof. Th. Eimer.† From this I find that, although, as Weismann points out, Dorfmeister did not succeed—apparently from not employing a low enough temperature—in transforming the *prorsa*-form into the *levana*-form, but obtained only some few of the intermediate form *porima*, yet he was apparently repeatedly successful in the important converse experiment (where Weismann's results were almost negative), obtaining *prorsa* by means of warmth from the *prorsa* August brood. He further obtained numerous gradations of the intermediate form *porima*, stages which under natural conditions occur so rarely that, during forty years' collecting, he met with only a single specimen in the wild state in places where the forms *levana* and *prorsa* were quite common. Dorfmeister was clearly the first to point out that temperature exercises its chief influence during the act of pupation or shortly afterwards, but he expressed his "inability to decide whether the modifications obtained were the direct consequence of the rise in temperature, or only the indirect, depending on the shortening of the time of development caused by the increased temperature."

Familiar to all of us is the fine series of papers on temperature experiments contributed to our "Transactions" and "Proceedings" to the "Entomologist," and to the "Proceedings of the South London Entomological Society" by our Secretary, Mr. F. Merrifield; they are eight in number, the first having been published in 1888 and the last in 1897.‡ Mr. Merrifield's earlier experiments were made with Geo-

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* "Ueber der Einwirkung verschiedener während der Entwickelungsperioden angewendeter Wärmegrade auf das Farbung und Zeichnung der Schmetterlinge." (Mittheil. Naturw. Vereins für Steiermark, 1864.)

† "Entstehung der Arten auf Grund von Vererben erworbene Eigenschaften nach der Gesetzen organischer Wächsens," 1888. (Engl. transl., by J. T. Cunningham, 1890, Sect. iv, pp. 131–134. I have to thank Mr. Merrifield for lending me this work.)

‡ For a most convenient précis and illustration of Mr. Merrifield's work, by Dr. F. A. Dixey, see "Nature," vol. 57, pp. 184–188 (1897).

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metrid moths of the genera *Selenia* and *Ennomos*, certain species of which have normally two differing seasonal forms in England, and they extended to the application of both icing and forcing for various periods in all stages from egg to imago. The results were of much interest from many points of view, and more especially as showing (*a*) that the continued application of low temperature to the pupæ reared from eggs laid by the spring brood produced moths more and more like their parents, instead of the natural summer form; (*b*) that the opposite experiment of applying heat to the pupæ from eggs of the summer brood was fatal to a majority of individuals, and produced in the survivors a proportion of the summer form but mainly specimens intermediate only between the spring and summer types; (*c*) that it was in the pupal state that temperatures exercised their chief influence; (*d*) that forcing produced pale and comparatively spotless moths, while cooling or icing produced dark and much spotted ones. Another noteworthy point was that the application of *moisture* in combination with various temperatures to the pupæ of *S. tetralunaria* and *E. autumnaria* had no effect on the resulting moths.

The dimorphic species next treated by Mr. Merrifield in 1892–93 were *Pieris napi*, *Araschnia levana*, and *Chrysophanus phlæas*. The results in the first and second of these species were generally confirmatory of those obtained by previous experimenters. In the case of *C. phlæas*, which, though many-brooded almost throughout its immense range, does not exhibit seasonal dimorphism in Europe except in Southern Italy, Corsica, and Greece, forcing caused on the upperside the dusky suffusion and larger black spots of the forewings characteristic of the southern summer form *eleus*, while cold induced exactly the opposite characters in the forewings and also a great broadening and radiation of the coppery band in the hindwings. In 1896, Mr. Merrifield experimented on pupæ of *Pieris daplidice*, and found that forcing produced the ordinary summer form, while cooling for six weeks brought out the spring form *bellidice*.

I have here only very briefly mentioned those of Mr. Merrifield's experiments which dealt with seasonally-dimorphic

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species. His researches extended besides to upwards of twenty monomorphic ones; they were carried out with admirable skill, care, and exactness of record, and the resulting phenomena—especially in the species of *Vanessa*—were not only most remarkable in themselves, but also, as disclosing apparently ancestral characters, of the deepest interest in their bearing on the phylogeny of the species concerned. The latter aspect of these investigations has been ably dealt with by Dr. F. A. Dixey, who, in his published comments on Mr. Merrifield's papers of 1893 and 1894,* points out that they seem to go far towards indicating the possibility that a disturbance of natural temperature conditions, whether in the direction of heat or cold, can produce in a monomorphic species a tendency towards reversion, and also notes the production by these experiments of ancestral features in *Vanessa io*, *V. polychloros*, and *Grapta C.-album*.

Concurrently with Mr. Merrifield's later work appeared both Dr. M. Standfuss's † and Prof. Weismann's ‡ important memoirs, containing accounts of the series of temperature experiments carried on by them respectively in the course of the last decade. Standfuss's paper of 1894 deals with the effects of the warm and cold treatment of the summer pupæ of nine species of European butterflies. None of these can be included among seasonally-dimorphic species in Europe itself, but the author points out that the effect of heat on the Zürich pupæ of *Papilio machaon* was to produce specimens perfectly resembling the August form of the species that is found in Syria. Other striking results as given by the

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* See Dr. Dixey's papers (1) "On the Phylogenetic Significance of the Variations produced by difference of Temperature in *Vanessa atalanta*" (Trans. Ent. Soc. Lond., 1893, p. 69); and (2) "Mr. Merrifield's Experiments in Temperature Variation as bearing on Theories of Heredity." (*Op. cit.*, 1894, p. 439.)

† "Ueber die Gründe der Variation und Aberration des Falterstadiums bei den Schmetterlingen," 1894. (Engl. transl. by Dr. F. A. Dixey in "Entomologist," 1895.)

"Handbuch der Paläarktischen Gross-Schmetterlinge für Forscher und Sammler," 1896.

‡ "New Experiments on the Seasonal Dimorphism of Lepidoptera" (1895). Engl. transl. by W. E. Nicholson in "Entomologist," 1896.

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experimenter were the production of specimens representing (*a*) Local forms, such as constantly occur in nature in certain definite localities; in *Vanessa urticæ*, *Pyrameis cardui*, and to some extent in *Papilio machaon* and *Vanessa antiopa*: (*b*) Aberrations, like those which now occur in nature; in *V. io*, *P. cardui*, and *Argynnis aglaia*: (*c*) Phylogenetic forms, "which may have either existed in past epochs, or may perhaps be destined to arise in future:" in certain cooled *V. io* and *V. antiopa* and certain warmed *V. atalanta*, and the reverse respectively. Noting the remarkable circumstance that the same conditions lead to such diverse effects in different species—the changes wrought in one species being entirely within the limits of its variation at the present day, while in another they far surpass those limits,—he suggests that the species coming under the former category are the phylogenetically older, and those belonging to the latter are the phylogenetically younger. The author found that the high temperature of 104° F. rapidly caused death in nearly all the species tested—*P. machaon* and *G. C.-album* proving least sensitive—but low temperatures prolonged for even four weeks were much better tolerated; and it was thought that this favoured the conclusion that the species so tested "were constrained in past ages to accommodate themselves much more to lower than to higher temperatures."

In the edition of his "Handbuch" which appeared in 1896, Standfuss recapitulated the cases published in 1894, and added mention of a warmth experiment with *Gonepteryx rhamni* which had the effect of inducing in the females some indications of the yellow colouring of the males. He also gave excellent coloured figures of most of the more marked variations resulting from temperature treatment, some of them exhibiting marvellous divergence from the normal form now existing in nature.

Before turning to Weismann's memoir of 1895, it will be convenient to refer briefly to Standfuss's recent and elaborate treatise issued during the present year (1898).* After re-

* "Experimentelle Zoologische Studien mit Lepidoptern. A. Temperatur-Experimente." (Denkschr. Schweiz. Naturf-Gesellsch., xxxvi, i, 1898.)

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viewing (in Sect. I.) his experiments as to effects from treatment of pupæ with constant moderately high (+37° to +39° C.) or moderately low (+4° to +6° C.) temperatures in the years from 1885 to the beginning of 1895, the author proceeds (in Sect. II.) to give an account of the continuation of these "Warm and Cold" experiments during the succeeding period from the middle of 1895 to 1897. These additional experiments were made on no fewer than fifty-six species of European Lepidoptera (thirty-six butterflies and twenty moths) and on a largely-increased number of specimens; and their results were found to be fully confirmatory of those derived from the earlier more restricted experiments, affording various fresh instances of the production of more or less marked variation in the directions previously indicated, *viz.*: seasonal forms, local forms, aberrations, phylogenetic forms, and forms showing assumption of the male colouring by the female. Under the respective headings of "Frost-Experiments" (Sect. III.) and "Heat-Experiments" (Sect. IV.) the several results are given of employing temperatures under 0° C. (0° to −18° C., and exceptionally to − 20° C.), and those above +40° C. (up to +45° C.); and the attempt is made (Sect. V.) to explain from the results of these two sets of experiments the active cause of most of the "Aberrations" occurring in nature. Attention is directed to the extremely interesting fact that the aberrations resulting from the artificial very high temperatures agree closely with the aberrations found in nature,* while aberrations like those produced by the use of very low temperatures are never found in nature; and the inference drawn from this is that the typical aberrations occurring naturally among the Nymphalidæ are produced by the temporary influence of a high degree of heat (40° to 45° C.).

I cannot here do more than just refer to the remaining

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* This is well illustrated by Plate IV accompanying the memoir, where figures of Aberrations, (a) captured at large, and (b) forced at very high temperature, of the following species, are given side by side, *viz.*: *Vanessa polychloros*, *V. antiopa*, *V. atalanta*, and *Pyrameis cardui*, figures 1, 3, 5, 7 differing very slightly respectively from figures 2, 4, 6, and 8. (Plate III figures the Aberrations produced in the same four species by "Frost-Experiments.")

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sections of Dr. Standfuss's treatise; they include a consideration of the mode of action of the frost and heat experiments, a discussion as to the nature of aberrations, and an account of the further breeding of aberrational *Vanessa urticæ*, and with the concluding remarks at pp. 37 and 38 will well repay perusal. Some idea of the satisfactory and extensive scale upon which the experiments were conducted, may be gathered from Standfuss's statement that he had employed altogether during 1895–97 the number of over 42,000 pupæ belonging to about 60 different species.*

Weismann's memoir of 1895, above referred to, contains a full record of his later experiments and results in the cases of *Araschnia levana*, *Chrysophanus phlæas*, and *Pieris napi*, as well as in those of *Pararge egeria* (with its "climatic variety," *meione*) and *Vanessa urticæ*. It further treats of the effect on pupæ of variously-coloured light, and on hibernating pupæ of warmth, and concludes with a comprehensive general review of the whole subject, including a comparison of the results of some of his own experiments with those obtained by Merrifield and Standfuss. In the case of *A. levana*, he not only succeeded, by means of temperatures of 27–28° C., and 30–32° C., in obtaining repeatedly a small number of the *prorsa*-form from the second summer generation of that form, but also proved that occasionally the same result arose in isolated instances without the use of a higher temperature than that of an ordinary warm room. It was further established that the intermediate forms known as *porima*, so rare under natural conditions, are produced whenever a brood is subjected to an unsuitable temperature at the beginning of the pupal stage, occurring indeed with the second brood from unusual cold, and with the third brood from unusual heat. As regards the seasonal forms of *Pieris napi* it was shown that low temperature effects the conversion of the summer form into the winter, only when

* Dr. E. Fischer, of Zürich, has also carried out very extensive temperature experiments on European Lepidoptera with most striking results, which are mentioned by Weismann, Merrifield, and Standfuss. I have not seen Dr. Fischer's published accounts of his work, but I believe he did not experiment with seasonally dimorphic species.

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applied immediately after pupation; while repeated experiments with the variety *bryoniæ* gave no sufficient support to Weismann's view (see above, p. 9) that this variety was the original parent-form of *napi*.

It is in this memoir that Weismann first recognises fully what he had formerly questioned, but had latterly* put forward as probable, *viz.*, that, besides the direct seasonal dimorphism attributable to temperature, there also exists *adaptive* seasonal dimorphism dependent on the indirect influence of the varying environment according to the time of year. He again cites the case of *A. levana* itself as possibly exhibiting in its *prorsa*-form mimicry of *Limenitis*, and suggests that the seasonal forms of *P. napi* may be adapted on the underside to the vegetation tints of spring and summer respectively. In the case of the latter species he expresses the belief that adaptive and direct seasonal dimorphism are combined, pointing out that the differences presented by the upperside may perhaps be referred to the direct influence of temperature. The possible adaptation of the green-and-white underside of the dimorphic *Anthocharis belia* to the respective resting plants of each season is also indicated.

The poverty, however, of such instances among the seasonally dimorphic species of the European butterfly-fauna is manifest; and it is thus satisfactory to find Weismann turning, in support of his view, to the numerous striking cases (first brought to his notice in 1894 in a paper by Dr. G. Brandes) of seasonal dimorphism occurring in tropical and sub-tropical regions, among which were instances where one seasonal form at least assumes a special protective colouring. Hitherto all the cases investigated and experimented on, whether in Europe or North America, had been found referable to the influence of high and low temperatures, and nobody seems to have suspected the occurrence of similar seasonal variation in hot countries; but, as Mr. L. de Nicéville, Mr. W. Doherty, and other observers have pointed out, and as Weismann was apt to recognise, the alternation of wet and dry seasons is as actively inciting an agent in the

* "Aeussere Einflüsse als Entwickelungsreize," 1894.

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production of seasonal dimorphism in many parts of the tropics, as that of hot and cold ones is in the temperate latitudes.

I must confess that I shared in the prevalent erroneous opinion that seasonal dimorphism was not to be looked for in countries without summer and winter seasons of greatly differing temperatures; and no doubt this was mainly due to my never having resided for any length of time in a region where the rainy season is the warmer and the dry one the cooler. In the south-west of the Cape Colony, where I was stationed, exactly opposite conditions prevail, and in the rainy winter, scarcely a dozen species of butterflies appear, and none of them presents any marked difference from the dry summer specimens of the same species. I was thus unprepared to attach due value to the suggestion, by my friend, Mr. W. D. Gooch, as early as the year 1877, of the occurrence of differing seasonal forms of butterflies in Natal, or to the opinion to the same effect given by Mr. A. J. Spiller in 1880 ("Entomologist," vol. xiii, p. 3). I believe this communication of Mr. Spiller's to have been the first published intimation of the apparent occurrence of seasonal dimorphism in the warmer parts of the world; and the four cases which he specially notices (in the genera *Anthocharis* [= *Teracolus*], *Pieris*, *Mycalesis*, and *Hypanis*) are undoubtedly true ones. Mr. Gooch (*op. cit.*, pp. 226 and 273) published his concurrence in the main with Mr. Spiller's view, but at the same time mentioned that, in the only two attempts he made to test the matter, by rearing *Teracolus omphale* and *Pieris severina*, he found no difference between the winter and summer broods, both belonging to the theoretical winter form with reduced black markings.

It was in 1885 that Mr. L. de Nicéville, the well-known authority on Indian butterflies, published* a notice of apparent seasonal dimorphism in several species of Calcutta *Satyrinæ* of the genera *Mycalesis*, *Ypthima* and *Melanitis*—the wet-season form presenting distinct ocellated spots on the

* "List of the Butterflies of Calcutta, etc." (Journ. Asiat. Soc. Bengal, liv, pl. ii, p. 39.)

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underside, and the dry-season form being without those markings. He suggested as a possible explanation, that while the conspicuously marked wet-season form is concealed by the dense vegetation, the dry-season non-ocellated form had in the scantily-clothed jungle found protection by the gradual loss through natural selection of the conspicuous markings. Mr. de Nicéville's specimens illustrating his paper were exhibited at a meeting of this Society in February, 1885, but his view did not meet with much acceptance among the members present, nor was any alternative explanation of the phenomenon brought forward. He was able, however, in the following year to adduce proof of the correctness of his theory in a memoir * giving details of the rearing of one seasonal form from eggs laid by the other in four of the seven cases named by him in his previous paper, *viz.*:— *Ypthima hübneri* and *Y. howra*; *Y. philomela* and *Y. marshallii*; *Mycalesis mineus* and *M. indistans*; *Melanitis leda* and *M. ismene*; these pairs consisting respectively of the ocellated wet-season form and non-ocellated dry-season form of each species concerned.

Just previously to the latter notable record of Mr. de Nicéville, Mr. W. Doherty had contributed to the same Journal † his four years' observation of seasonal variation while collecting Indian butterflies. He brings to notice that, speaking generally, there were *four* broods annually in that country, *viz.*: two in the wet season and two in the dry season, and that, while there was no perceptible difference between the two broods of the same season, there were often very marked differences between the wet-season broods and the dry-season ones. These differences included size (the wet-season form being usually smaller), the angulation of the wings, and the colouring and ocelli of the underside, and were well illustrated by species of *Junonia*, *Ypthima*, *Mycalesis*,

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* "On the Life-History of certain Calcutta Species of Satyrinæ, with special reference to the Seasonal Dimorphism alleged to occur in them." (*Op. cit.*, lv, pl. ii, p. 229, 1886.)

† "A List of Butterflies taken in Kumaon." (Journ. Asiat. Soc. Bengal, lv, pt. ii, p. 107.)

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and *Melanitis*. The author remarks that some countries with wet climate do not yield any but wet-season forms,* and conversely that some very dry countries produce only dry-season ones, instancing the case of *Junonia almana*, the dry-season form of which alone occurs in Scinde, while its wet-season form (*asterie*) only is met with in Ceylon and Singapore. He is of opinion that De Nicéville's view is strengthened by the fact that the dry-season forms are more or less leaf-like both in shape and in the underside colouring, while no such resemblance is manifested by the wet-season ones, and argues that this points to the greater exposure to danger in the dry season; but he is inclined to think that the eye-like underside markings in the wet season may serve as a protection from the attacks of birds. It is singular that, while this observant collector enumerates no fewer than twenty-three species of Pierinæ in his "List," he does not seem to have noticed the occurrence of seasonal dimorphism in the subfamily which is especially fertile in illustrations of it.

In view of the satisfactory evidence afforded by De Nicéville's experiments with Indian Satyrinæ, I could no longer doubt that many hitherto puzzling cases of variation among African butterflies would find their solution in the same way, especially as the dated specimens accessible all pointed to the seasonal character of the varieties. I kept the question constantly before my entomological correspondents in Natal and the other warmer parts of South Africa, and was enabled by their assistance to indicate, in 1889,† various extremely probable instances of a corresponding phenomenon among African Satyrinæ and Pierinæ. Among a most interesting collection made by Mr. A. W. Eriksson in tropical S.-W. Africa,

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* Mr. de Nicéville has recorded (Journ. Asiat. Soc. Bengal, lxiv, pt. ii, p. 362, 1895) that in N.E. Sumatra rain falls in every month of the year, and it is rare for a week to pass without a shower, and that consequently there are no dry-season forms of butterflies to be found there, with the solitary exception of the dry-season form of *Melanitis leda*, which (as in Java) prevails all the year round as commonly as the wet-season form.

† "South-African Butterflies," III, pp. 6, 7, 125, and 395 (1889).

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described by me in 1891,* I noted what appeared to be undoubted cases of seasonal dimorphism in species of Acræinæ, Lycænidæ and Pierinæ; and again, in cataloguing Mr. F. C. Selous's Manica butterflies in 1894,† I showed reason for recognising the prevalence of the same kind of variation, especially pointing out how in the case of *Melanitis leda* all the dated South African examples went to confirm De Nicéville's experience at Calcutta, and what strong similar ground existed for considering the much-discussed variation in the Nymphaline *Hamanumida dædalus* to be seasonal.

An important contribution to the elucidation of the subject was made in 1894 by the late Capt. E. Y. Watson in a paper entitled "Notes on the Synonymy of some Species of Indian Pierinæ." ‡

According to this experienced entomologist's observations some species—*Terias hecabe*, for instance—produce successive broods (from four in the cooler to ten or twelve in the warmer districts) throughout the year, and the last alone of the wet-season or dry-season broods respectively yields offspring exhibiting the opposite seasonal form; but it is at the same time pointed out that "in some cases the eggs laid by one female would produce more than one form, according to the state of the atmosphere shortly before the emergence of each individual, which is the period at which it would be chiefly affected." The author calls attention to the fact that "in different parts of the Indian Region, the seasons vary to a certain extent, so that it cannot be laid down that specimens captured in any particular month will belong to any particular form"; he defines, however, roughly the limits of the rainy and dry seasons and states that "the very large majority of specimens obtained during those periods will be wet- and dry-season forms respectively." Emphasis is laid on another important point, *viz.*, that the seasonally dimorphic species present numerous intermediate forms, and that these intermediate forms themselves vary according to the

* Proc. Zool. Soc. Lond., 1891, pp. 59, 64, 85, 89, 96, 97, and 99.
† *Op. cit.*, 1894, pp. 14, 22, 29, 37, 64, and 67.
‡ Journ. Bombay Nat. Hist. Soc., viii, p. 489 (1894).

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vegetation and rainfall, "so that the extreme of a rainy-season form from a district where the rainfall is great and the vegetation dense, is much more pronounced than the extreme of a rainy-season form from a district with slight rainfall and sparse vegetation; and these differences are even more marked in the dry-season forms." The genera of *Pierinæ* dealt with in this paper are *Huphina*, *Appias*, *Ixias*, *Terias*, and *Teracolus*, and seasonal dimorphism is shown to prevail largely in all of them, so that the author feels warranted in materially reducing the number of hitherto admitted species, contending that many of these are palpably founded on mere seasonal variations.

In 1895, I had the pleasure of receiving from a valued friend and correspondent in Natal, Mr. Cecil N. Barker, the MS. of an interesting paper he had drawn up, from many years' field observations, on the seasonal variation of butterflies in that colony and the adjacent territories. This paper, which was published the same year,* proceeds on much the same lines as that of Capt. Watson's just noticed, but, instead of being confined to the Pierinæ, traces the occurrence of the phenomenon throughout the suborder, indicating the following cases, *viz.*, Acræinæ 1 (in *Acræa*); Satyrinæ 2 (in *Mycalesis*); Nymphalinæ 9 (1 each in *Atella*, *Junonia*, *Hypanis*, *Hamanumida* and *Charaxes*, and 2 each in *Precis* and *Crenis*); Lycænidæ 3 (in *Lycæna*); and Pierinæ 20 (9 in *Teracolus*, 4 in *Pieris*, 3 each in *Eronia* and *Terias*, and 1 in *Herpænia*). In many of these thirty-five cases the seasonal differences and the occurrence of intermediate specimens about the change of season are carefully described; and several instances are recorded of the pairing of *Pieris gidica* with *P. abyssinica* or with intermediate examples. Mr. Barker's observations were decidedly in support of my own published opinion as to the seasonal dimorphism of *Hamanumida dædalus*, *Herpænia eriphia*, *Teracolus regina*, *T. speciosus*, *Pieris pigea*, *P. gidica*, *Eronia cleodora*, and *E. leda*.

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* "Notes on Seasonal Dimorphism of Rhopalocera in Natal." (Trans. Ent. Soc. Lond., 1895. p. 413.)

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Mr. Barker's paper was soon followed by one of equal interest * contributed to our "Transactions" by Mr. G. A. K. Marshall, who has a most wide and intimate knowledge of butterfly-life south of the Zambesi. Mr. Marshall, after expressing his concurrence with Mr. Barker's opinions on the subject, proceeds to criticise with justice Dr. A. G. Butler's rather random suggestion † that in the Acræinæ the presence of a broad apical black patch on the forewings indicates a wet-season form, proving this idea to be wholly untenable, at any rate in three of the five cases advanced by Dr. Butler. He goes on to indicate the signs of seasonal variation in nine species of *Acræa*, and notably in the Mashunaland *A. halali*, where both sexes vary strongly, and unlike the other known cases in the genus, have the black spots larger in the dry-season than in the wet-season form. To the numerous instances given by Barker he adds two more in *Mycalesis* and eight more in *Precis*. The latter are shown to offer a beautiful series of gradations in dimorphism, from the four species *P. natalica*, *P. elgiva*, *P. tugela* and *P. artaxia*, where —in addition to larger size and more falcate forewings—the dry-season change is almost limited to the dull withered-leaf colour and marking of the underside; then to the two species *P. ceryne* and *P. archesia*, where the upperside as well presents considerable alteration both in colour and marking; and finally, to the species *P. simia* and *P. octavia-natalensis*, where the suggested respective dry-season forms *P. cuama* and *P. sesamus* present such extreme disparity in the aspect of both upper and under sides as to render it almost incredible that they can belong to the same species as the two wet-season forms in question.

The actual rearing of the dry-season form of *Terias zoe* from eggs laid by the latter, and its proving to be (as had long been anticipated) the butterfly known as *T. brigitta*, is recorded in this paper on the authority of that practised collector and observer, my friend Mr. J. M. Hutchinson, of

* "Notes on Seasonal Dimorphism in South-African Butterflies." (*Op. cit.*, 1896, p. 551.)

† Trans. Ent. Soc., Lond., 1895, p. 519.

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Estcourt in Natal; and early in 1897, Mr. Marshall, writing from that locality, informed me that he had succeeded in rearing three specimens of *Teracolus auxo*, a wet-season form, from eggs laid by *T. topha*, a dry-season butterfly. In each of these two Pierine cases the close relationship of the seasonal forms was so manifest, that all the circumstances of their occurrence led one to expect the species-identity to be proved before very long; but it was otherwise in the case of *Precis octavia-natalensis* and *P. sesamus*, notwithstanding the significant facts—very close resemblance in both larvæ and pupæ, occasional pairing of the two forms, and the existence of various intermediate examples—which favoured a similar conclusion. Thus it was with no ordinary interest that I received from Prof. Poulton Mr. Marshall's announcement, in a letter dated June, 1898, that in three cases he had bred *P. sesamus* from the eggs laid by *P. octavia-natalensis*, and that I saw the actual specimens of parent and offspring in two of the three cases, which had been sent to the Hope Department of the Oxford University Museum. An excellent account by Mr. Marshall of what he rightly describes as "the most remarkable instance of seasonal variation as yet known" was published in July last.* What makes the case so striking is not alone the very great difference of the upperside—deep salmon-red with black borders and spots in *octavia-natalensis*, and violaceous-blue streaked with black, and a continuous series of salmon-red spots in *sesamus*—but that of the underside also—almost the same as the upperside, but pinker in *octavia-natalensis*, and very dark greenish-bronze with black streaks in *sesamus*. Owing to the latter disparity nothing could be more different than the appearance of the two forms when at rest, *octavia-natalensis* being very conspicuous, while *sesamus* is well concealed;† and this wide

* See "Seasonal Dimorphism in Butterflies of the Genus *Precis*, Doubl." (Ann. and Mag. Nat. Hist., (7), ii, p. 30 (1898).)

† The rarely-occurring intermediate examples, as I have pointed out (South-Afr. Butt., i, pp. 230, 231, and 233; 1887), exhibit a complete gradation as respects both upperside and underside.

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divergence is associated with the differing haunts and habits of the two forms. Mr. Marshall seems inclined to the view that the wet-season form *octavia-natalensis* is the older one, and that the dry-season form *sesamus*, with its distinctly protective underside, may be the result of greater persecution —in the scarcity of insects of other orders—during that season. On the other hand, he suggests the possibility of the wet-season *natalensis*-form being in process of modification in mimicry of the prevalent red black-spotted *Acræas* of the same region; in which case *sesamus* would have to be taken as the older form. I consider the latter to be more likely than the former view, seeing how much less *sesamus* has diverged than *octavia-natalensis* from the general pattern of the genus *Precis*.*

A noteworthy fact in Mr. Marshall's experience in this case was that, while in the second instance recorded he reared an example of *sesamus* from an egg laid by *octavia-natalensis*, he also obtained, only five days later, from another egg laid by the same mother, on the same day, a pure *octavia-natalensis*. He expressly states that the two larvæ from which these amazingly different butterflies resulted were reared from the egg under precisely similar conditions; and he adds that not a few similar instances had come under his notice. This is sufficiently remarkable, but it by no means exhibits the apparent extreme of variation among the offspring of one mother; for Mr. de Nicéville (in a letter of 13th June last) assures me that in India "at the change of the season, in one brood, from one batch of eggs laid by one female, you sometimes get both seasonal forms and all intermediate ones."† Such cases, like those of more or less

* The only other species of *Precis* of the *octavia* pattern and colouring is *P. simia* (considered by Mr. Marshall to be the wet-season form of the dry-season *P. cuama*) and this species may possibly also be mimetic of the *Acrææ*.

† It would be of the very greatest service to these inquiries if such a series as this, the offspring of one mother, could be preserved in its entirety, together with a full record of all the conditions bearing on the case. Mr. de Nicéville does not mention the actual species to which his remark applies.

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complete resistance to altered temperature, so frequent in the experiments of Weismann and others, point very clearly to the operation of some other factor than the degree of humidity, or of temperature; but it must be admitted that we are as yet quite in obscurity as to its actual nature, and that our investigations into seasonal dimorphism must be far more systematically and thoroughly prosecuted before conclusions of a satisfactory character can be arrived at.

While the observations already on record, to which I have drawn attention above, render it beyond question that seasonal dimorphism is of world-wide prevalence, it is at the same time surprising—considering the great and increasing study devoted to exotic butterflies of late years—that so very little is definitely known of the actual range and conditions of its occurrence beyond European limits. So far as the Palæarctic Region is concerned we are indebted to Standfuss* for a comprehensive list of the cases recognised, distinguishing between those where the seasonal disparity is so marked as to have led to the bestowal of distinct names on the two forms, and those where the disparity is less and no second name has been given. In the former category there are 23 cases (17 in Butterflies and 6 in Moths), and in the latter 15 (14 in Butterflies and 1 in Moths), making in all 38 cases, *viz.*, 31 in Butterflies and 7 in Moths. The butterflies comprised in the more marked category include 1 case in Satyrinæ, 2 cases in Nymphalinæ, 5 in Lycænidæ, 6 in Pierinæ, and 3 in Papilioninæ; while those in the less marked category are three cases in Satyrinæ, 3 in Nymphalinæ, 3 in Lycænidæ, and 5 in Pierinæ, so that taking the totals of both categories in their order of numerical importance we have 11 cases in Pierinæ, 8 in Lycænidæ, 5 in Nymphalinæ, 4 in Satyrinæ, and 3 in Papilioninæ. The moths are all ranked in the more marked category with the exception of a Liparid (*Dasychira abietis*); they are two in the Bombycidæ and four Geometers. The number of known cases in the Palæarctic Region thus appears to be very

* "Handbuch der Paläarktischen Gross-Schmetterlinge für Forscher und Sammler," Ed. 1896, p. 229.

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small, when contrasted with the very large number of species of the groups to which they belong ascertained to inhabit the Region; but it may be observed that a considerable proportion of them must be of greatly extended occurrence and very ancient standing, Pryer* noting no fewer than six of them in Japan (besides three additional cases in local species); and Dr. A. Fritze† further recording in the same country the case of *Araschnia levana* (var. *burejana*).

When we turn to the great tropical and subtropical Regions, where butterfly life finds its fullest and most varied development, it is almost disheartening to find how extremely little has been done in the observation of this apparently prominent feature of seasonal variation. With the exception of India in the Oriental Region, and South Africa in the Ethiopian Region, none of the hot or warmer countries have hitherto received the slightest investigation as regards this particular subject of biological inquiry. I can find no record of any observations in East or West Africa, in Australia, or in Central and South America. Feeling especially the deplorable lack of information from that paradise of butterflies, the Neotropical Region, I consulted Dr. F. A. Dixey with the view of ascertaining whether the Pierinæ—the group which he has made so emphatically his own, and which in the Old World has yielded more cases of seasonal dimorphism than any other—offered any instances of the kind in Central or South America. He most obligingly brought together, in the Hope Department of the Oxford University Museum, a series of Neotropical species of *Callidryas*, all of which included forms corresponding in character with the seasonal varieties occurring among their Old-World congeners and allies, *viz.*, a larger form, of deep or rich colouring with the underside freckling and markings strongly expressed; a smaller form, of paler colouring, with the underside freckling

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* "Rhopalocera Nihonica: a Description of the Butterflies of Japan," 1886–88. The species named are *Papilio machaon*, *P. xuthus*, *Pieris napi*, *Colias hyale*, *Vanessa C.-album*, and *Polyommatus phlæas*.

† Zool. Anzeiger, 1890, p. 12. Transl. in Ann. and Mag. Nat. Hist., 6), v, p. 200 (1890).

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and markings very faint or altogether absent; and, in addition to these, specimens holding an intermediate position between them as regards the characters mentioned. Dr. Dixey exhibited this series (with some additions and substitutions) at the Society's meeting on December 7th, and explained that, in order to meet the possible objection that the variations in question pointed to *local* forms, he had been careful in the case of each species to select examples from the same locality. The species concerned were *C. rurina* (Mexico), *C. neocypris* (South Paraguay), *C. argante* (Brazil), *C. agarithe* (Mexico), *C. sennæ* (Guatemala and Brazil), and *C. philea* (Guatemala). There was no sufficient evidence as to the seasons of appearance of these variations, only seven examples (four *C. argante* and three *C. sennæ*) in the whole series bearing dates of capture; but the nature of them, and the parallelism with which they were displayed by each of the six species, were such as to leave little doubt of their being seasonal.

I am further indebted to Dr. Dixey for the first indication of the occurrence of seasonal dimorphism in Australia, afforded by the Old-World section (*Catopsilia*) of the same genus *Callidryas*. In one species, *C. gorgophone*, from Melville Island and Queensland, gradations are found quite in correspondence with those observed in both Indian and Neotropical species; and the same phases are even more completely illustrated in a fine series of Brisbane examples of the well-known Oriental *C. crocale*, which lends some probability to Dr. Dixey's suspicion that *C. crocale* and *C. pomona* (including *C. catilla*) will prove to be seasonal forms of one species.*

In bringing to a close this attempt to give a general survey of what has been published on the subject, I purposely abstain

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* *C. crocale* is an extremely variable and very widely distributed butterfly. Mr. de Nicéville ("Gazetteer of Sikkim," 1894, p. 166; and "Journ. Asiat. Soc. Bengal," lxiv, ii, p. 490, 1895) considers that *C. catilla* cannot be held a distinct species from *C. crocale*, all the supposed distinctive characters proving quite inconstant, and breaking down when large numbers of specimens are compared. But he does not think seasonal dimorphism comes into play here, "the innumerable varieties which are found in both sexes occurring at all times."

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from indulging in any speculative disquisition on my own part, because, however attractive to myself such a course might be, I very much doubt if, in the present very restricted bounds of our knowledge, it would prove of any service to the Society. To generalise or to speculate to any good purpose demands a considerable body of well-ascertained fact as a basis, and this—as my remarks have shown—is precisely what is wanting in the present instance, notwithstanding the labours of the entomologists of distinction to whom reference has been made. While fully recognising that the artificial-temperature experiments noted above have been designed and conducted with a skill and thoroughness truly admirable so far as certain species of Palæarctic and Nearctic Lepidoptera are concerned, it cannot at the same time be denied that even in Europe very little has been done to ascertain all the natural conditions under which seasonal dimorphism occurs, or to what extent it is adaptive to the environment; and when we turn to the wide tropical and subtropical regions, it is obvious that we stand upon merely the threshold of inquiry. We have, indeed, from these regions—thanks to such capable observers as De Nicéville and Marshall—some valid experimental evidence to guide us, but this must be very greatly added to, and the life-history of the dimorphic species be worked out from many different directions, before we can hope to approach to a clear comprehension of the complex problem now presented by the extraordinarily impressionable and mutable lepidopterous organism. In studying the cases under notice, it is impossible not to recognise that the most diverse influences are at work,—indications of protective and mimetic adaptation, and of sexual selection as well, being combined or contrasted with the effects of varying temperatures and degrees of atmospheric humidity, and with distinct tendencies in the direction of reversion to ancestral characters.

The investigation is one to tax the insight and resource of the ablest and most zealous naturalists, and demands unremitting and most exact observation and record, with carefully controlled breeding from the ova for many successive generations, during a considerable series of years. I am as fully persuaded now as I was on the occasion of my last year's

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Address, that such researches as these can never be satisfactorily prosecuted, and still less brought to any interpretation of permanent scientific value, without the establishment in tropical countries of fitly equipped *Biological Stations* for the special observation and study, under as natural conditions as possible, of the surrounding terrestrial fauna. It is unnecessary to dwell upon the manifest advantages attendant on well-directed work pursued steadily and continuously in such a zoological observatory, planted in the very midst of the abounding forms of tropical life, or to do more than mention the exceptionally favourable opportunities for discovery that would thus be afforded. In conclusion, therefore, I will simply express my firm conviction that from a few well organised stations of this kind, on carefully chosen sites in the four great tropical regions, Science would gain more in ten years than from the casual and incomplete observations of ordinary collectors and travellers for the next half century.

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Explanation of Plate I.

Illustrating Mr. R. Trimen's paper "On some new or little-known Species of African Butterflies."

Fig. 1. *Acræa hypoleuca*, sp. n., ♂.

2. *Lycæna gigantea*, sp. n., ♂.

3. „ „ „ ♀.

4. *Desmolycæna masaensis*, gen. et sp. n., ♂.

5. *Aphnæus erikssoni*, Trim., ♂.

6. *Iolaus alienus*, sp. n., ♂.

7. *Durbania pallida*, sp. n., ♂.

8. „ „ „ ♀.

9. *Mimacræa marshalli*, sp. n.

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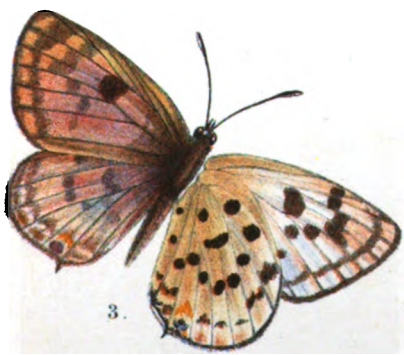

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Mintern Bros. Chromo.

New African Butterflies.

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Explanation of Plate II.

Illustrating Mr. G. C. Champion's "Notes on American and other Tingitidæ."

Fig. 1, 1*a* *Dolichocysta venusta*, gen. et sp. n.

2 *Corythucha fuscomaculata*, Stål.

3, 3*a* *Stephanitis mitrata*, Stål.

4 *Leptobyrsa steini*, Stål.

5 *Gargaphia trichoptera*, Stål.

6, 6*a* *Pachycysta diaphana*, gen. et sp. n.

7, 7*a* *Leptostyla furcata*, Stål.

8 *Leptopharsa elegantula*, Stål.

9 *Leptodictya fuscocincta*, Stål.

10, 10*a* *Leptocysta sexnebulosa*, Stål.

11, 11*a* *Sphærocysta globifera*, Stål.

12 *Amblystira pallipes*, Stål.

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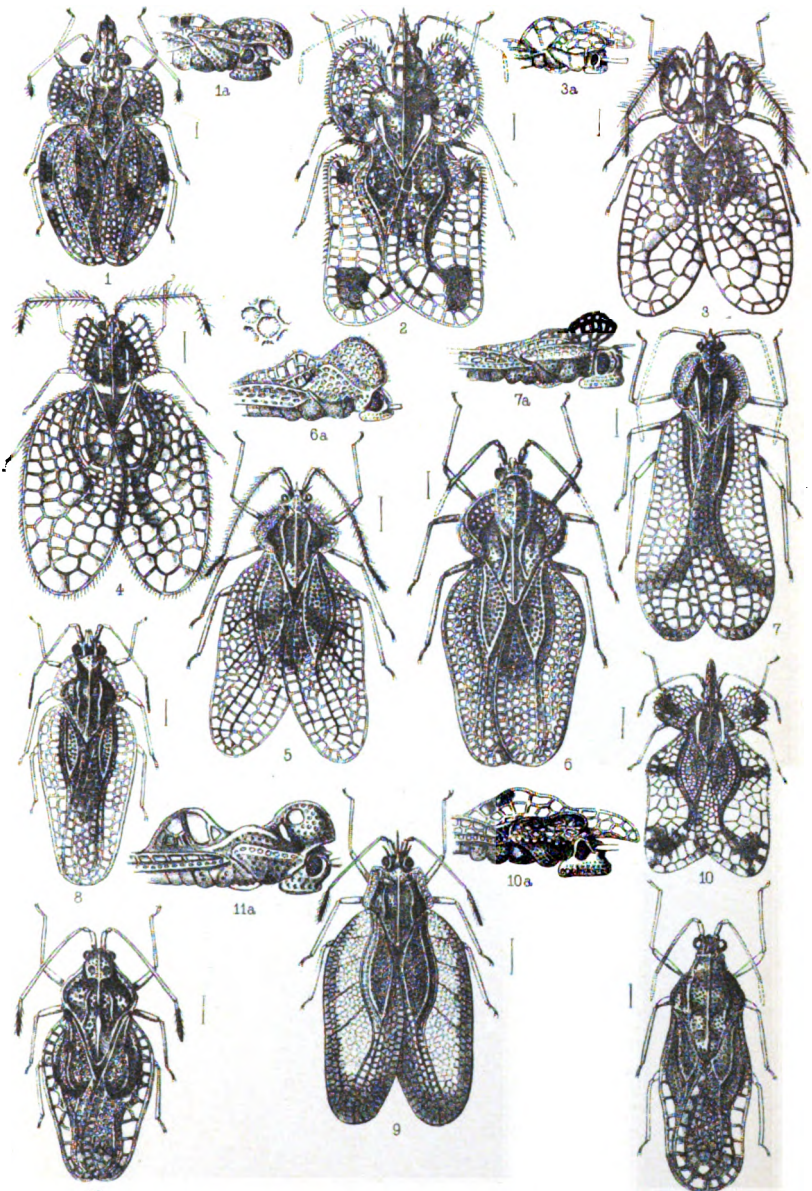

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American Tingitidae.

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Explanation of Plate III.

Illustrating Mr. G. C. Champion's "Notes on American and other Tingitidæ."

Fig. 1. *Tigava pulchella*, Stål.

2. *Teleonemia* (*Amaurosterphus*) *morio*, Stål.

3. „ *aterrima*, Stål.

4. „ *validicornis*, Stål.

5. „ *luctuosa*, Stål.

6. „ *prolixa*, Stål.

7. „ *longicornis*, sp. n.

8. „ *belfragii*, Stål.

9. „ *brevipennis*, sp. n.

10. „ (*Americia*) *limbata*, Stål.

11. *Monanthia loricata*, Dist.

12. „ *parmata*, Dist.

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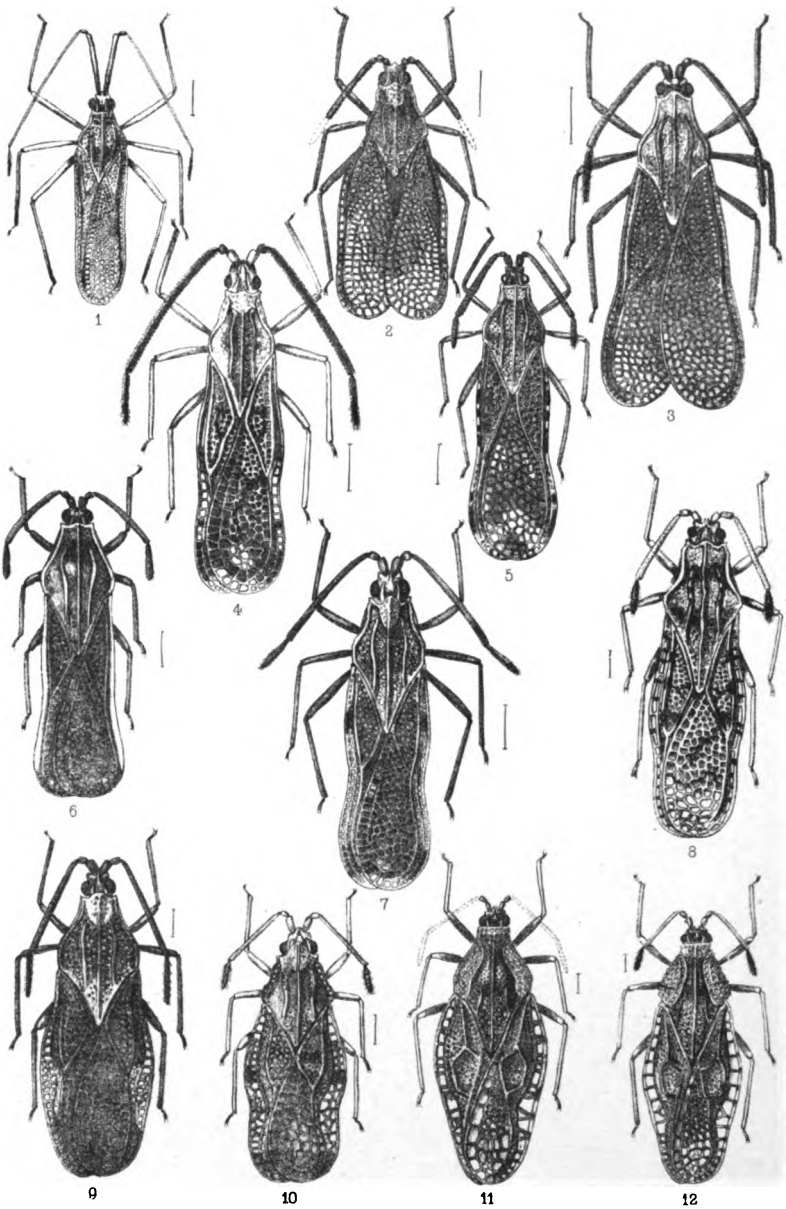

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American Tingitidæ

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Explanation of Plate IV.

Illustrating Mr. G. C. Griffiths's paper "On the Frenulum of the Lepidoptera."

Fig. 1. Frenulum of *Protoparce convolvuli*, ♂.
2. ,, *Sphinx ligustri*, ♀.
3. Spinulæ of *Protoparce cingulata*, ♀.
4. Abortive spina of *Smerinthus populi*, ♂.
5. Spinulæ of *Smerinthus populi*, ♀.
6. Spina of *Protoparce cingulata*, ♂.
7. Frenulum of *Composia olympia*, ♀.
8. ,, *Arctia sp.*, ♂ (Florida).
9. ,, *Callimorphia virgo*, ♀.
10. ,, *Zygæna ephialtes*, ♂.
11. ,, *Drepana unguicula*, ♂.
12. ,, *Tanagra chærophyllata*, ♂.
13. ,, *Castnia licus*, ♂.
14. ,, *Euschemon rafflesiæ*, ♂.
15. Spinulæ of *Sesia tipuliformis*, ♀.
16. Frenulum of *Cataclysta lemnalis*, ♂.

m = median nervure of forewing; c = costa of hindwing.

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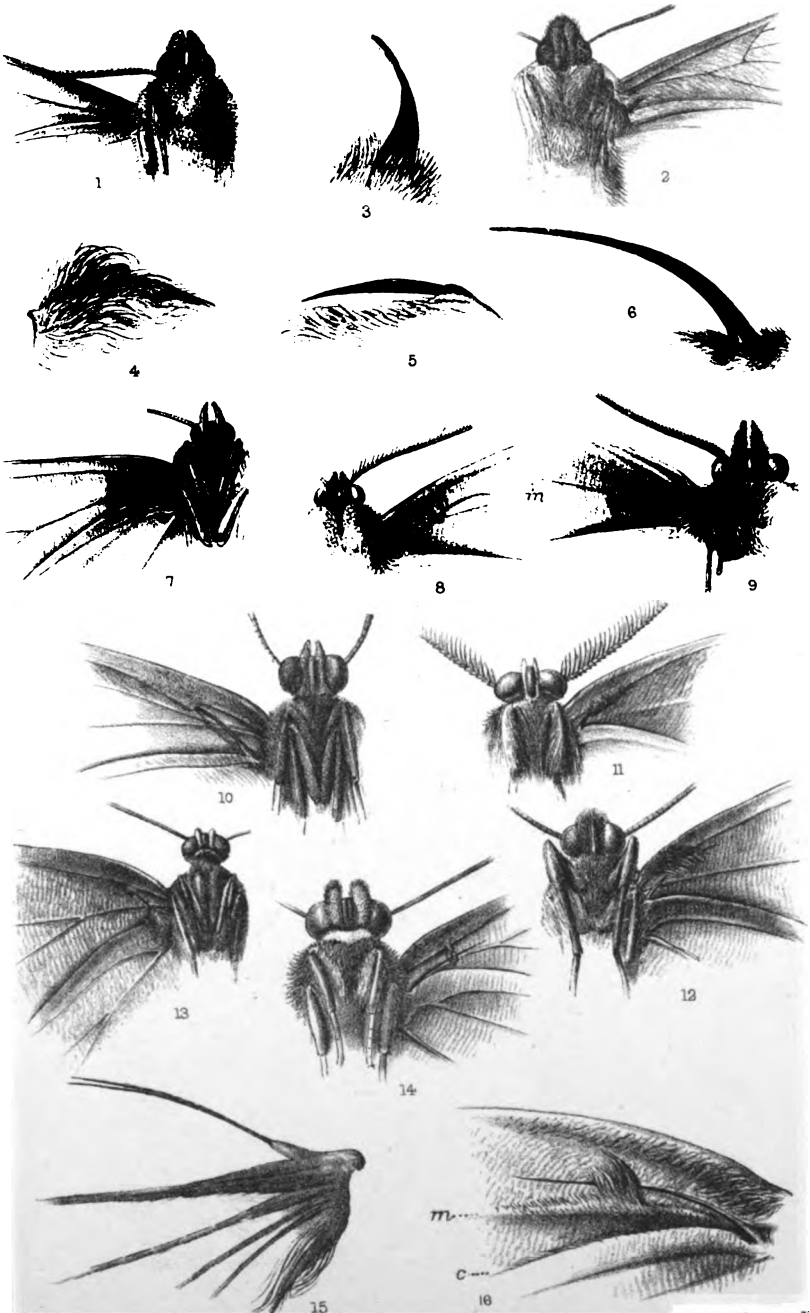

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The Frenulum of Lepidoptera.

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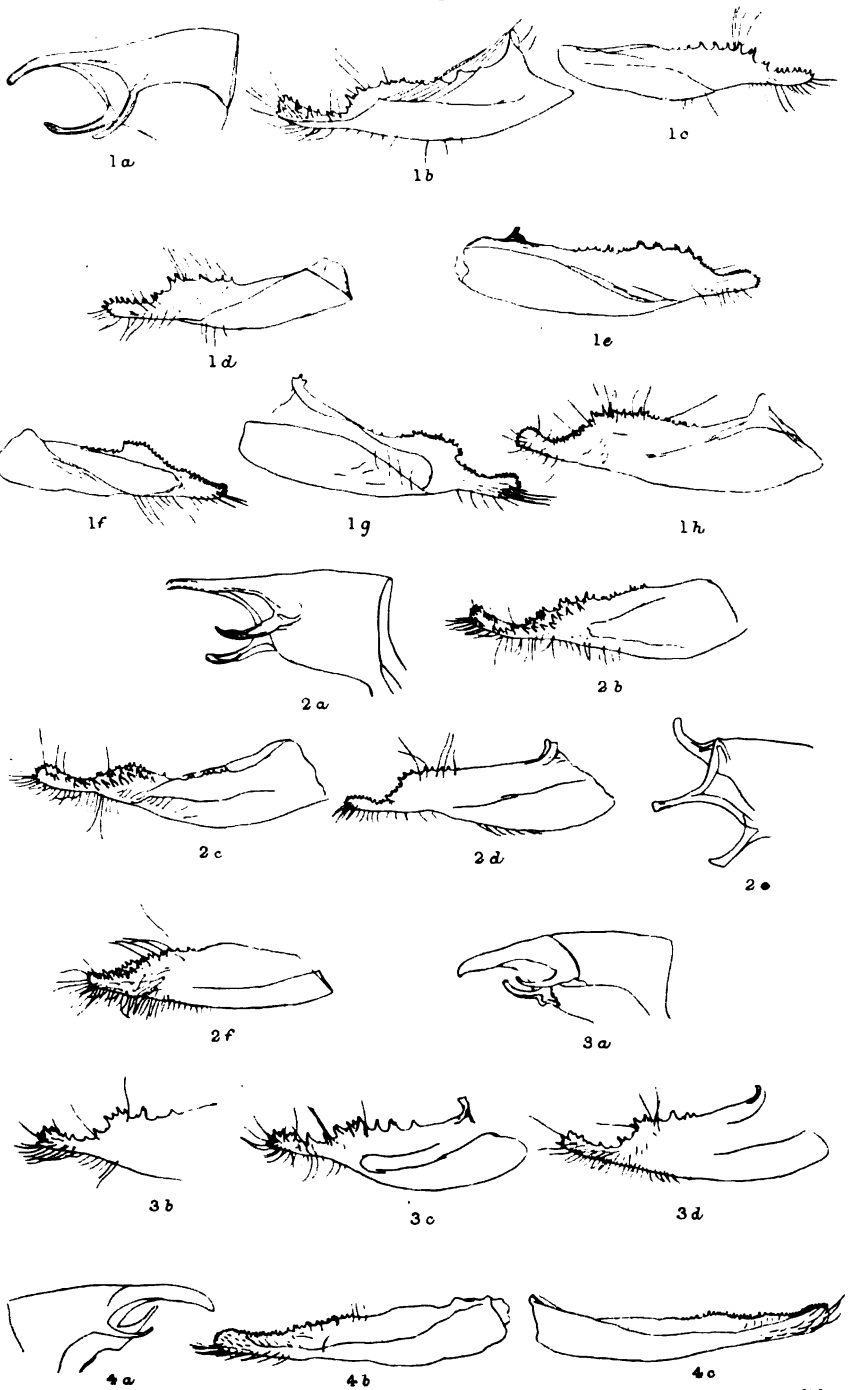

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1, Ligea. 2, Euryale. 3, Cæcilia. 4, Vidleri.

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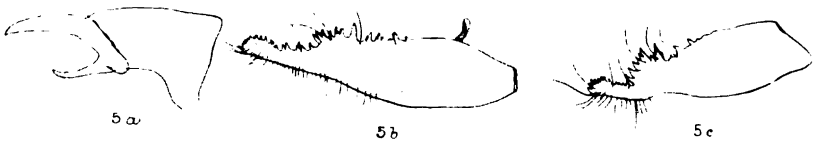

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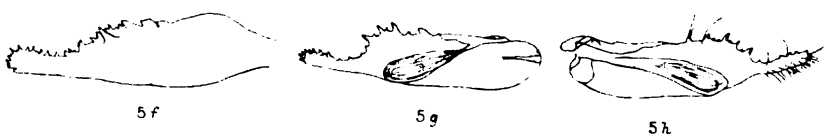

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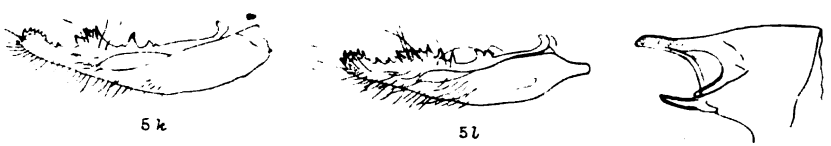

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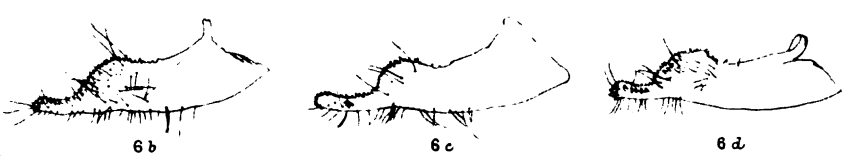

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6 *e* 6 *f* 6 *g*

EREBIA.

5, Manto. 6, Eriphyle.

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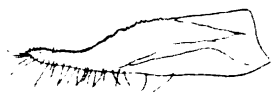
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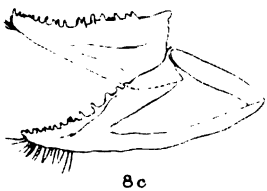
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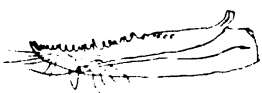
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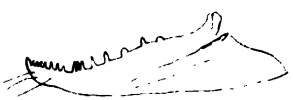
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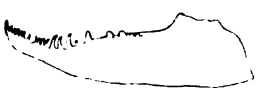
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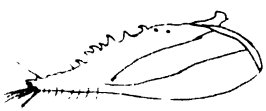
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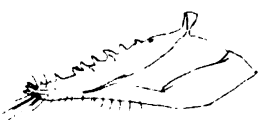
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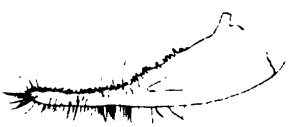
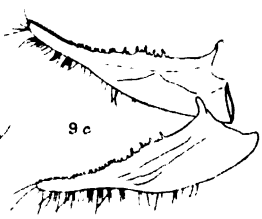

9b


9c

9e

West, Newman lith.

EREBIA.

7, Epiphron. 8, Pharte. 9, Melampus.

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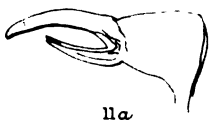
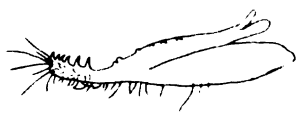
10 a

10 b

10 c



11 a

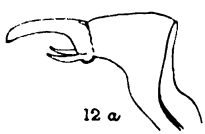


11 b

11 c

11 d

11 e

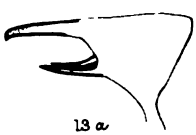


12 a

12 b

12 c

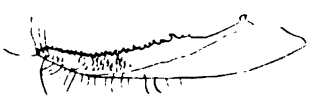
12 d



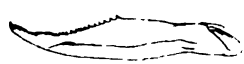
13 a

13 b

13 c



13 d



13 e

West, Newman lith

EREBIA.

10, Arete. 11, Christi. 12, Keferstein. 13, Flavofasciata.

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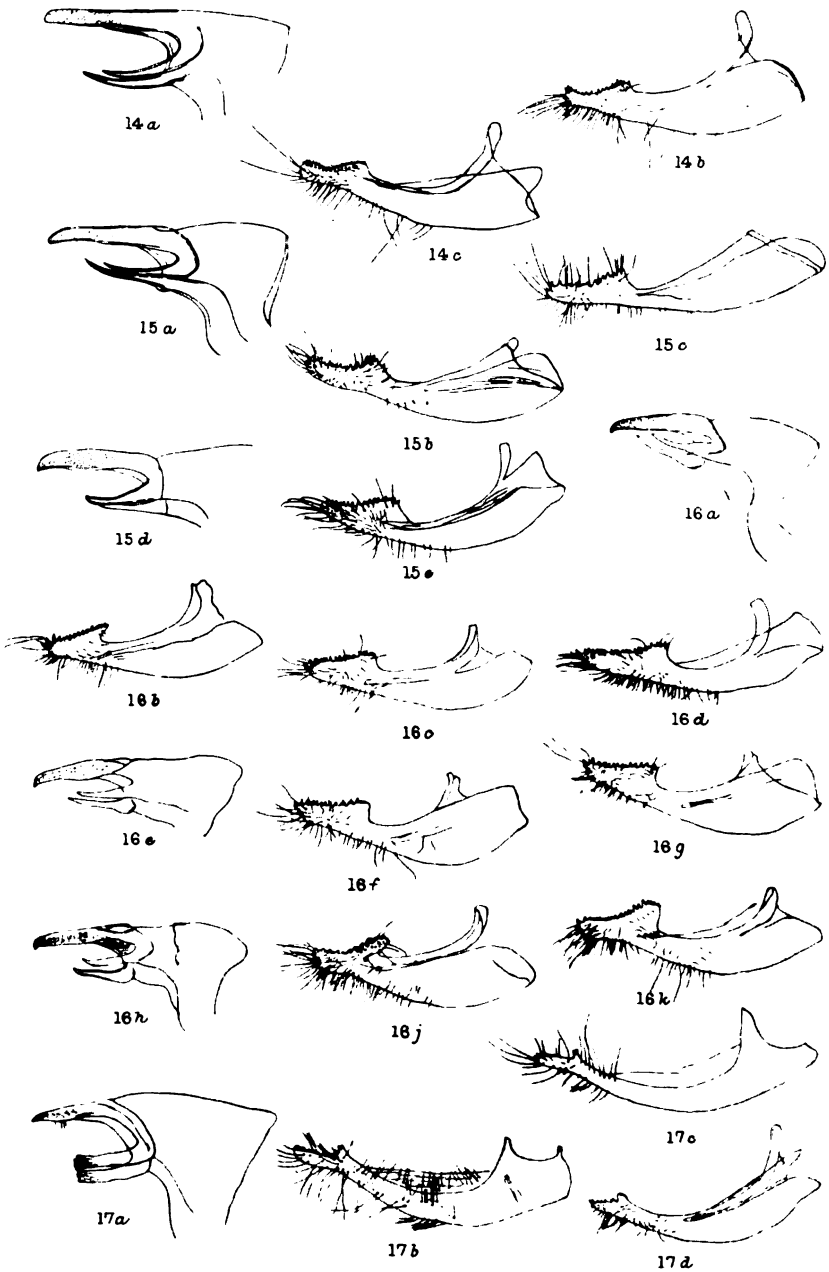

EREBIA. West, Newman lith.

14, Ceto. 15, Maurisius. 16, Pawlowskyi. 17, Æthiops.

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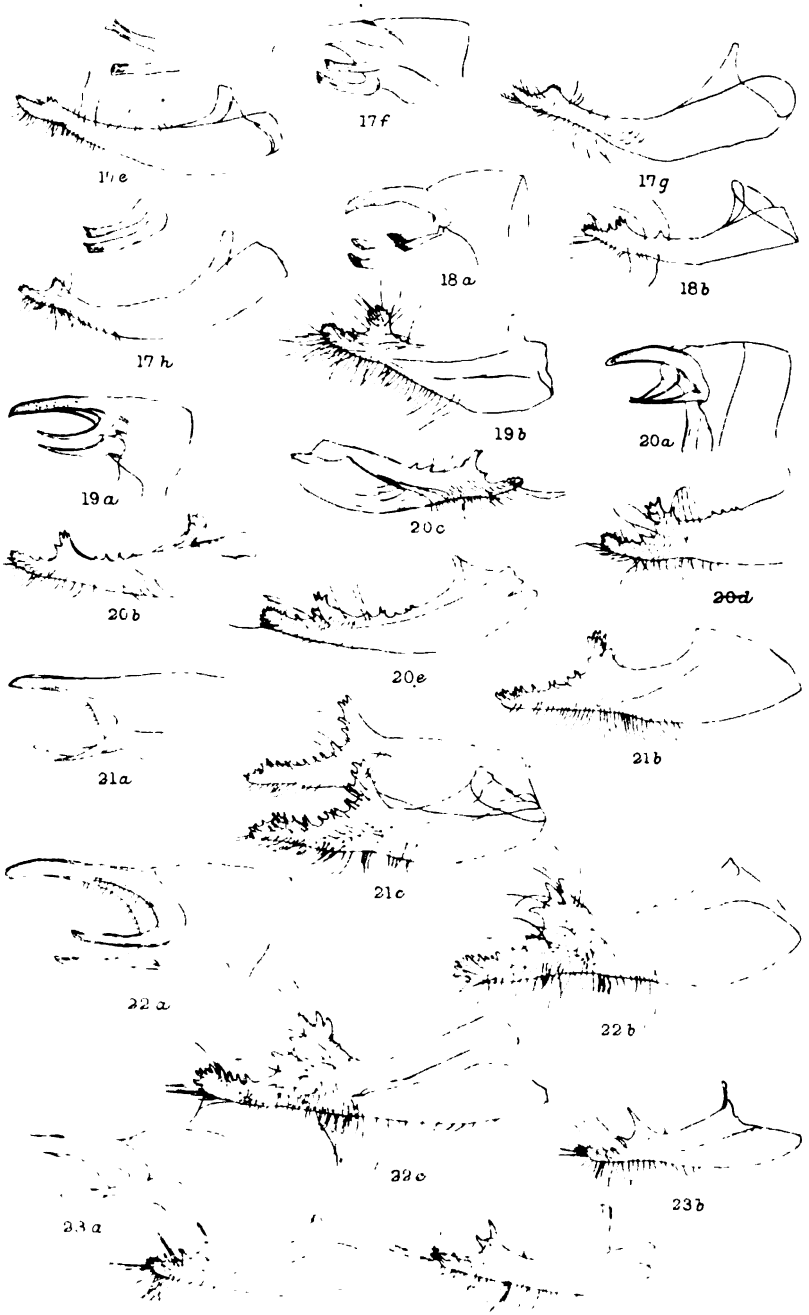

EREBIA

West, Newman lith

Pl. XIII. 15, Alecto. 19, Mnestra. 22, Scipione
[illegible] 22, Manto. 23, Stygne

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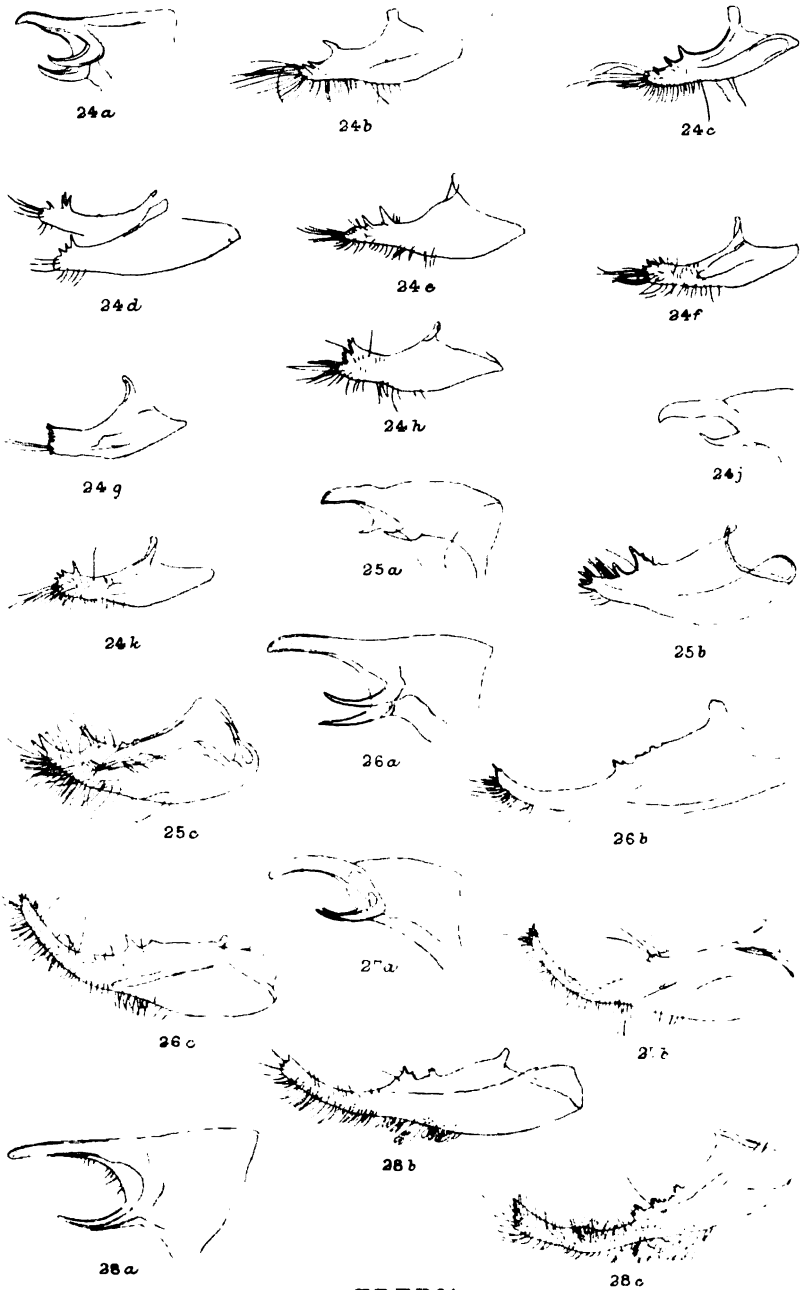

EREBIA

West, Newman lith

24, Tyndarus. 25, Epistygne. 26, Neoridas.
27, Zapateri. 28, Pronoe

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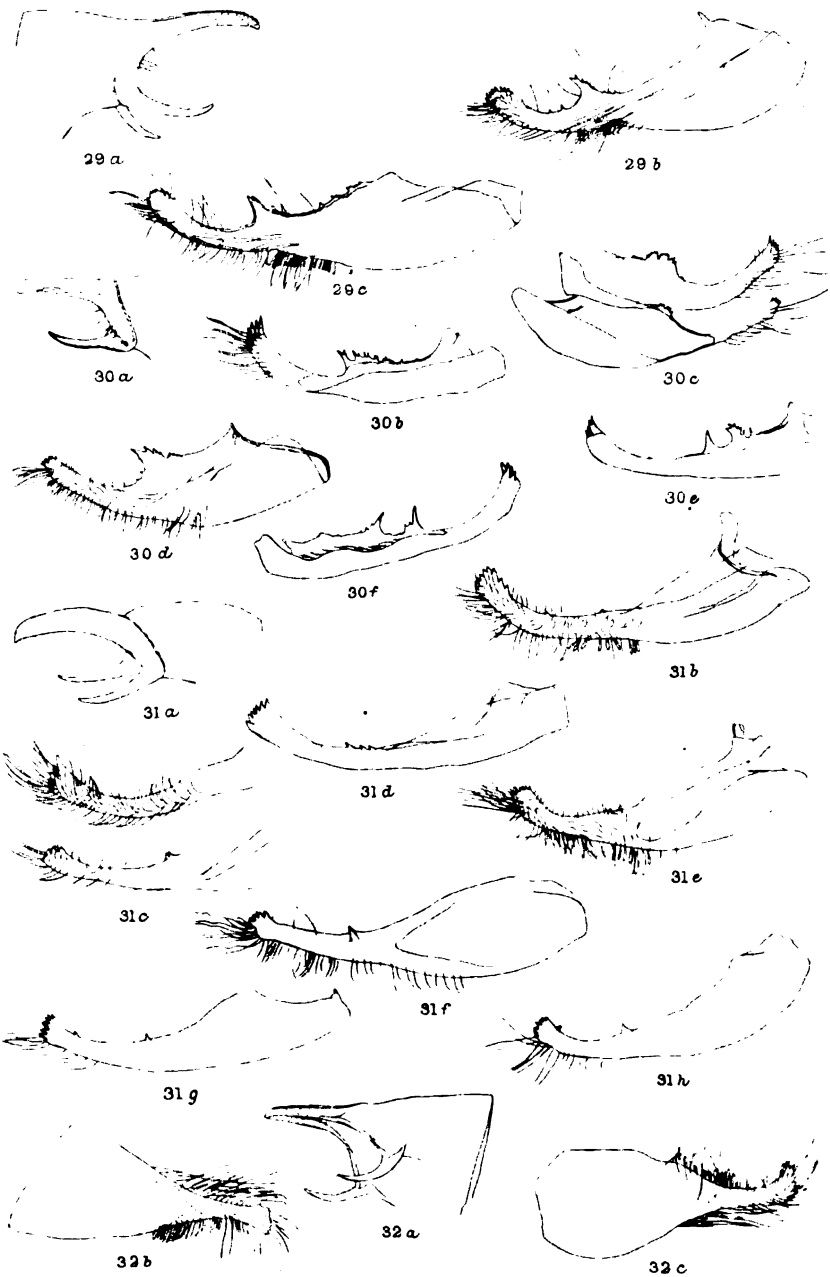

EREBIA. West, Newman lith

29, Scipio. 30, Lefebvrei. 31, Nerine. 32, Goante.

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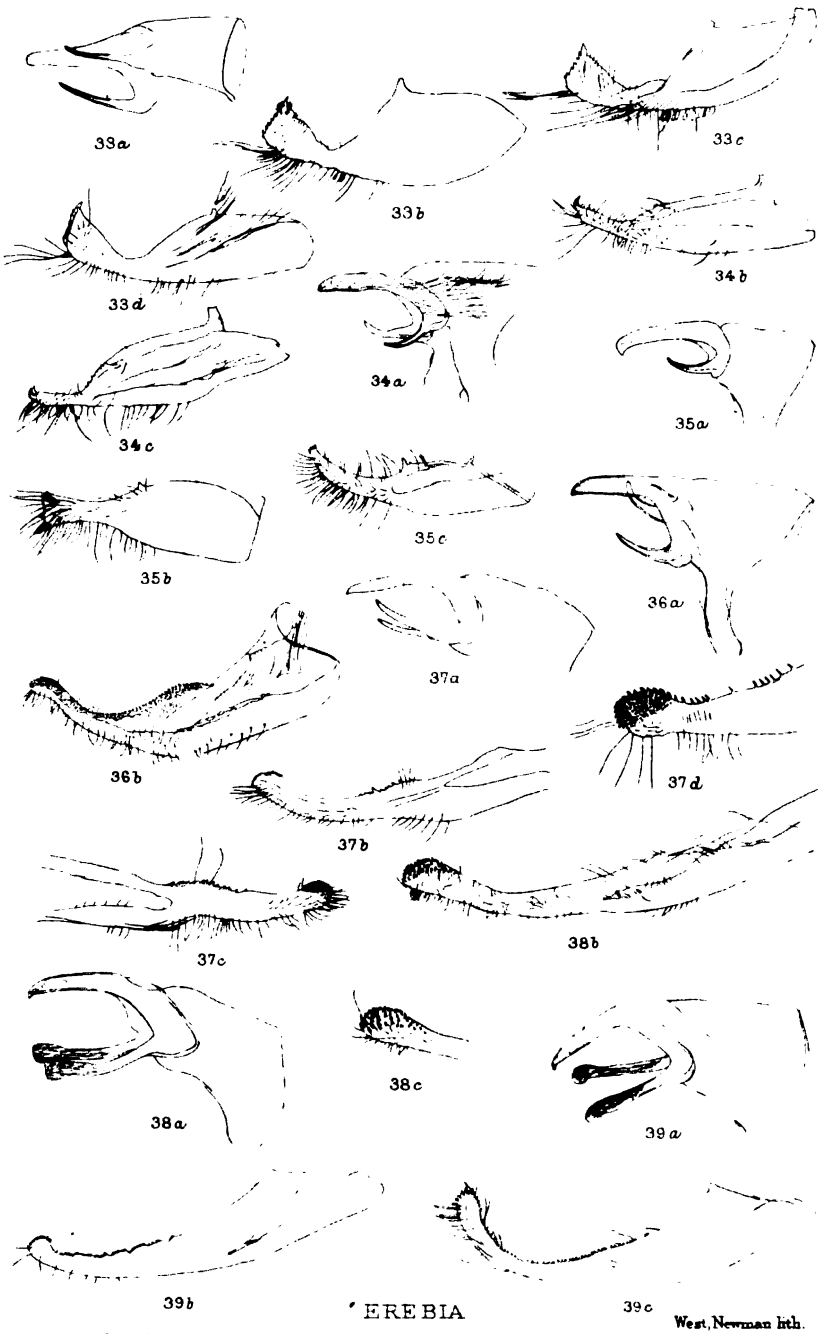

33, Stygne. 34, Œme. 35, Lappona. 36, Evias.
37, Rossii 38, Embla. 39, Cyclopius.

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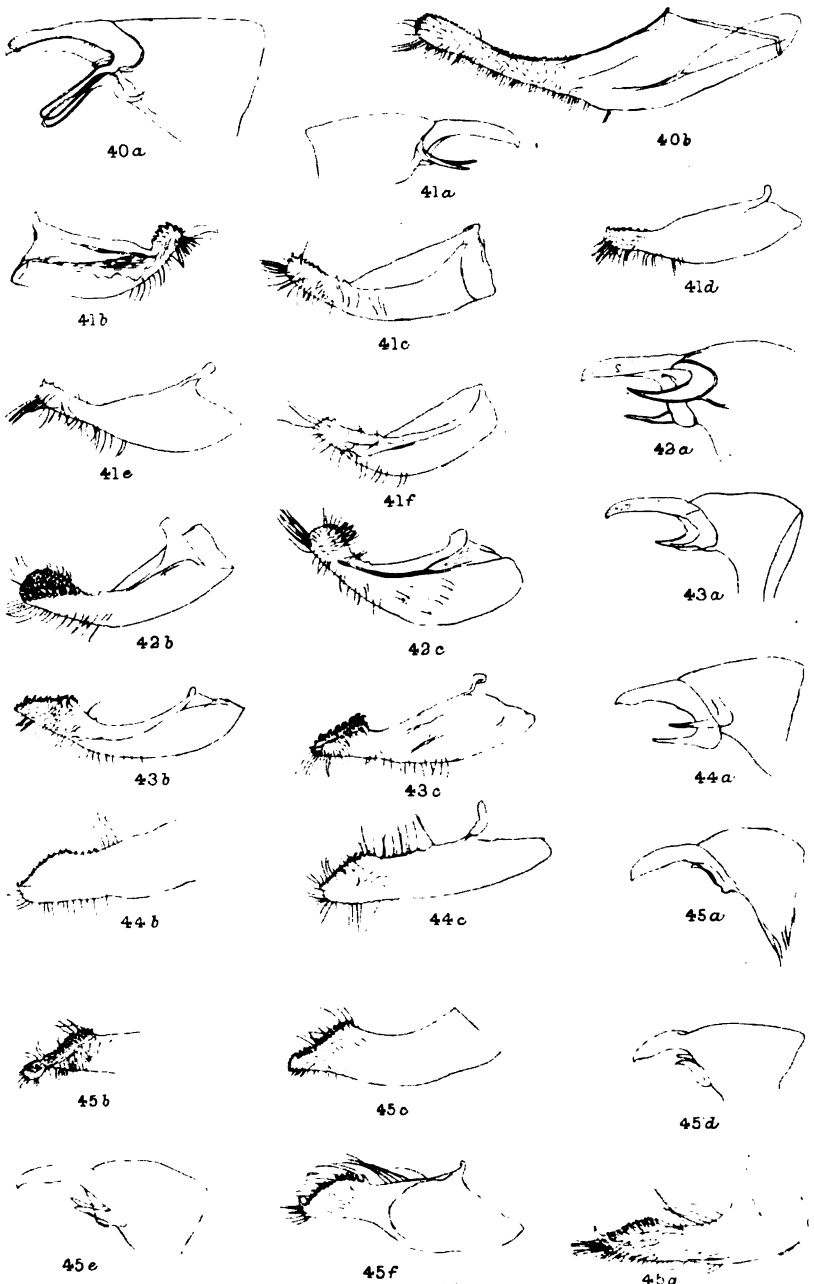

EREBIA.

West, Newman lith

40, Disa. 41, Medusa. 42, Hewitsoni. 43, Epipsodea.
44, Meta. 45, *a-c*. Sibo. 45, *d-g*. Ocnus.

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46a

46b

47a

47b

47c

48a

48b

48c

49a

49b

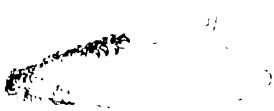
49c

50a

50b

51b

50c


51c

51*b*

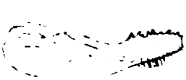
51a

51*a*

52a

52b

52c


52d

ERE BIA.

West Newman lith.

46, Kalmuka. 47, Radians 48, Turanica. 49, Edda.
50, Tristis. 51, Dabanensis. 51* Tundra. 52, Discoidalis.

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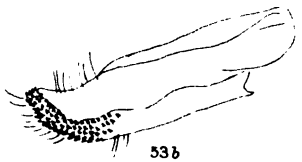
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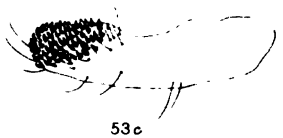
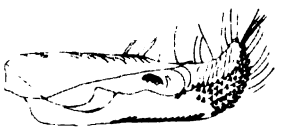

53c

53a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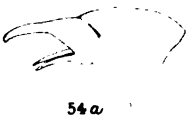
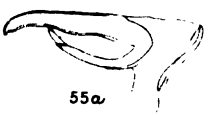

54a

54b


55a

55b

55c

55d

56a

56b

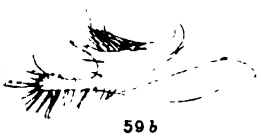
57a

57b

58a

58b

59a


59b

60a

60b

EREBIA.

West Newman lith.

53, Fasciata. 54, Parmenio. 55, Afra. 56, Myops.
57, Maracandica. 58, Jordana. 59, Hades. 60, Herse.

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Explanation of Plate XVII.

Illustrating Sir George F. Hampson's paper on "The Moths of the Lesser Antilles."

Figs. 1, 15. *Ptychoglene xanthopleura.*
2. *Caradrina tristicta.*
3. *Tarachidia flavibasis.*
4. *Spragueia canofusa.*
5. *Stictoptera tumidicosta.*
6. *Pseudcraspedia melanosticta.*
7. *Baniana veluticollis.*
8. *Cisthene metoxia.*
9. *Eublemma rosescens.*
10. *Catephia scriptura.*
11. *Duomitus punctifer.*
12. *Givira pulverosa.*
13. *Nodaria griseirena.*
14. *Drepanopalpia polycyma.*
16. *Ingura canofusa.*
17. *Tarachidia holophæa.*
18. *Chusaris bisinuata.*
19. *Capnodes distacta.*
20. *Ditrogoptera trilineata.*
21. *Orthocraspeda bistrigata.*

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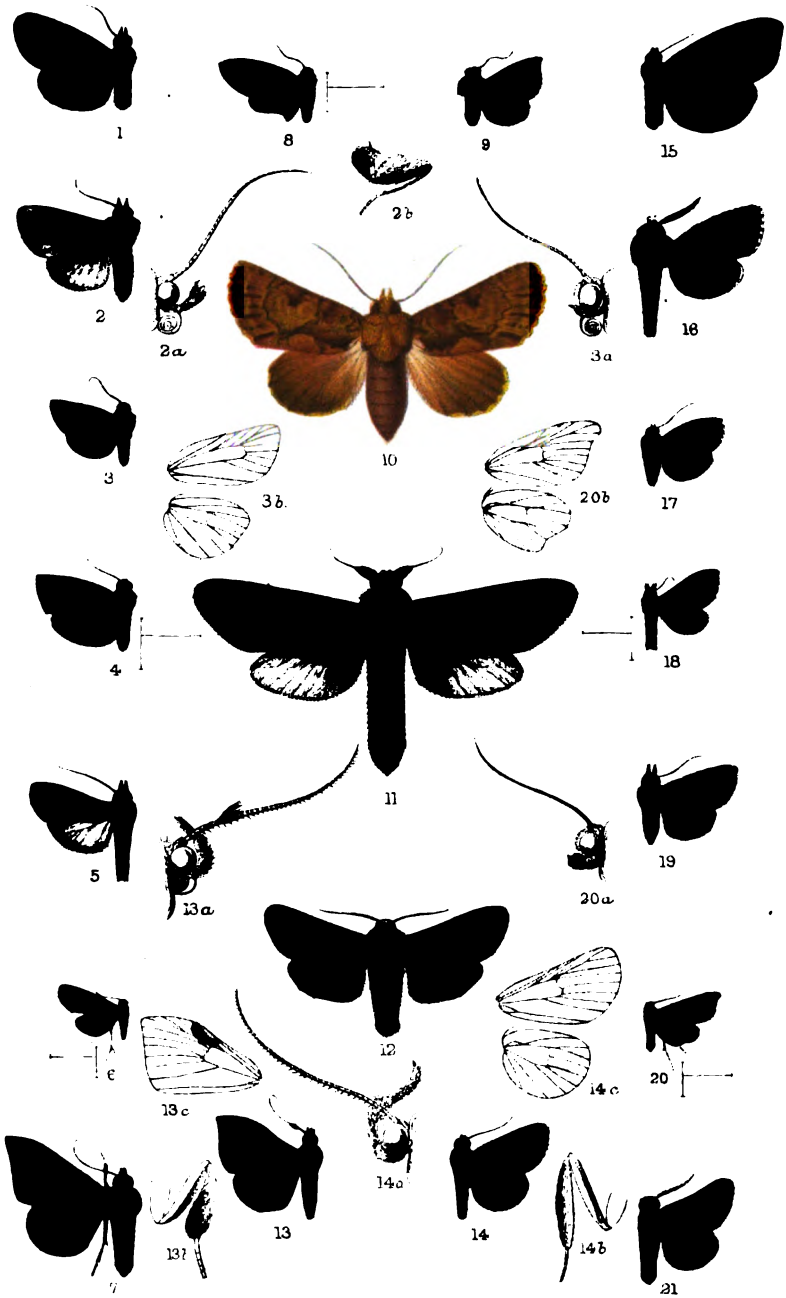

E. C. Knight del et lith

West, Newman chromo

Moths of the Lesser Antilles.

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Explanation of Plate XVIII.

Illustrating Mr. E. Ernest Green's "Further Notes on *Dyscritina*, Westw.", and Mr. M. Burr's Appendix thereto.

Diplatys (*Dyscritina*) *nigriceps*, Kirby.

Fig. 1. Penultimate stage, after loss of caudal appendages.

2. Fully grown larva.

3. Adult female.

Diplatys (*Dyscritina*) *longisetosa*, Westw.

Fig. 4. Fully grown larva.

5. Adult female.

16. Part of caudal appendage of larva.

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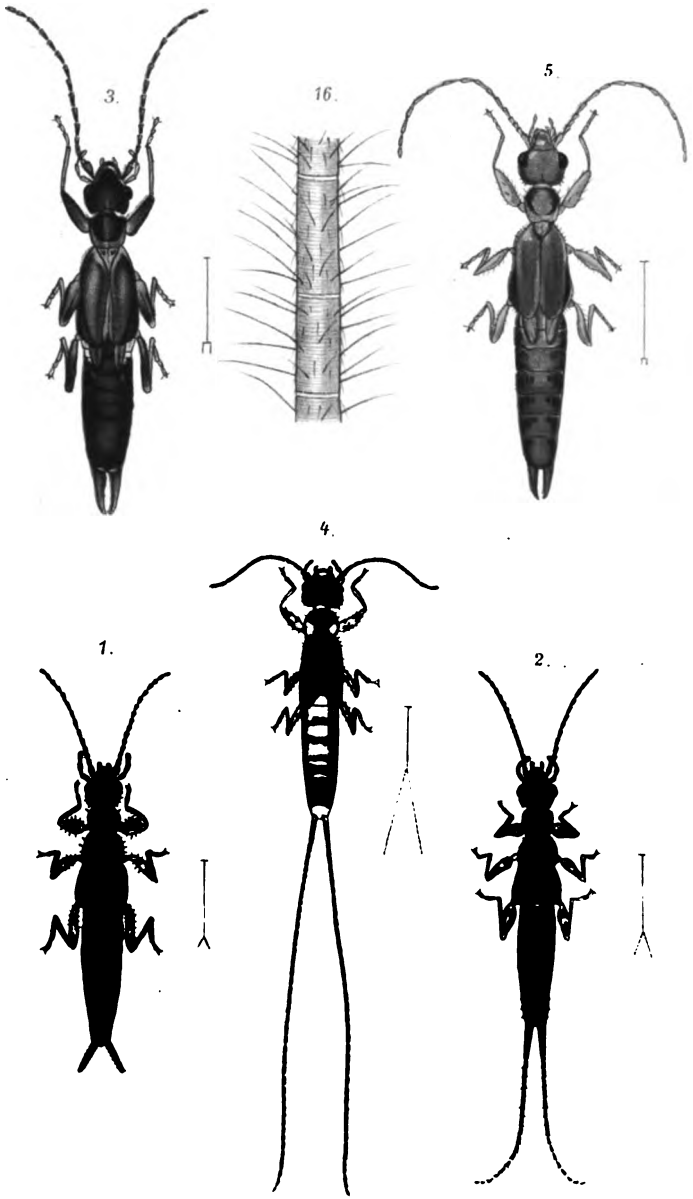

E. E. Green del. Th. Bannwarth, lith. et imp. Vienna.

THE TRANSFORMATIONS OF DYSCRITINA (DIPLATYS).

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Explanation of Plate XIX.

Illustrating Mr. E. Ernest Green's "Further Notes on *Dyscritina*, Westw.", and Mr. M. Burr's Appendix thereto.

Diplatys (*Dyscritina*) *nigriceps*, Kirby.

Fig. 6. Adult male with expanded wings.

7. Extremity of labial palpus, showing tactile organ.

8. Pygidium and forceps of adult female.

15. Part of caudal appendage of larva.

Diplatys (*Dyscritina*) *longisetosa*, Westw.

Fig. 9. Pygidium and forceps of adult female.

10. First abdominal segment of larva, showing the dorsal glandular folds.

11. Caudal appendages of penultimate stage, shortly before the final change.

12. Part of antenna of adult female, showing auditory (?) organs.

13. Terminal joint of larval antenna (after treatment with potash).

14. Posterior tarsus of adult female.

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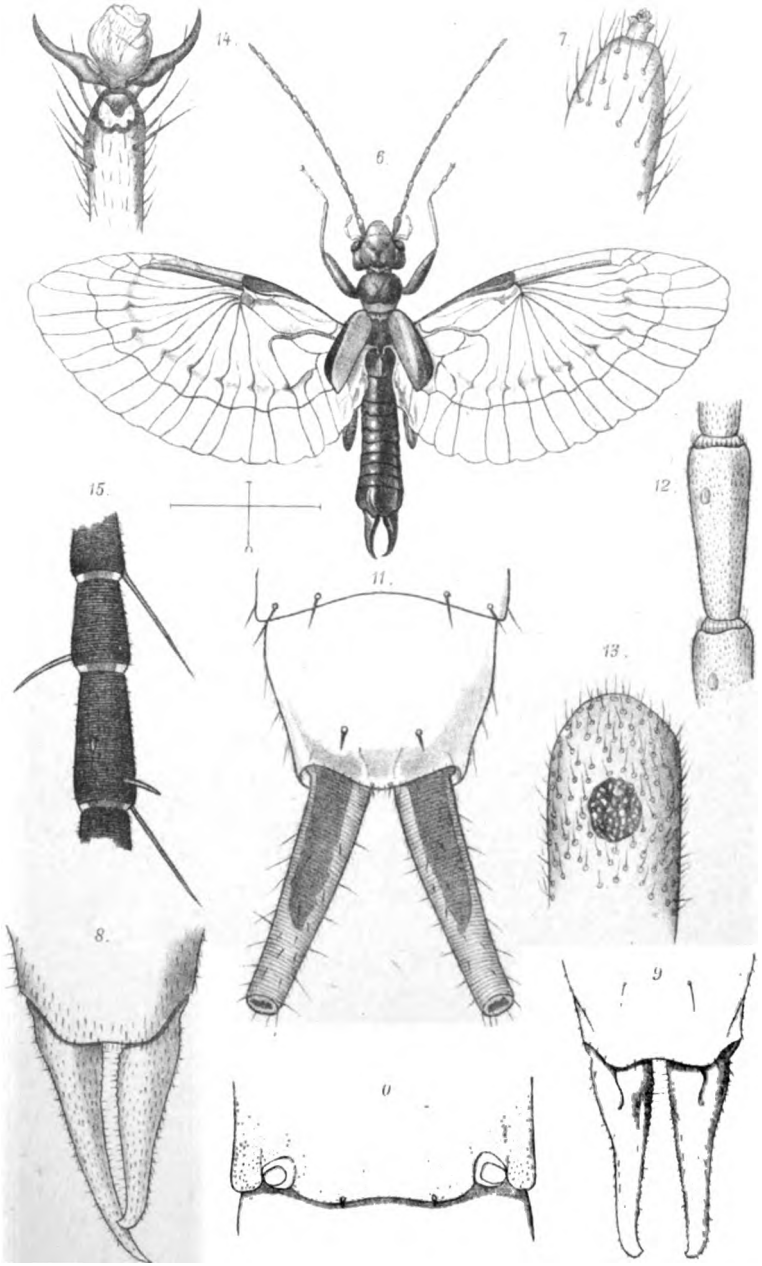

E.E.Green del. Th. Bannwarth, lith. et imp. Vienna.

THE TRANSFORMATIONS OF DYSCRITINA DIPLATYS.

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OF

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,, ,, 1882		1 10 0	1 2 6
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,, ,, 1884		1 8 0	1 1 0
,, ,, 1885		1 6 0	0 19 6
,, ,, 1886		1 6 0	0 19 6
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,, ,, 1888		1 15 0	1 6 3
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,, ,, 1893		1 5 6	0 19 3
,, ,, 1894		1 10 6	1 2 11
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III. HYMENOPTERA (**Chrysididæ, Ichneumonidæ, Braconidæ,** and **Evanidæ**), by the Rev. T. A. MARSHALL, M.A., F.E.S.; 1872	2	0	1	6
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V. HEMIPTERA (**Heteroptera** and **Homoptera**, *Cicadaria* and *Phytophthires*), by J. W. DOUGLAS and J. SCOTT; 1876	1	0	0	9

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NOTICE.

All persons exhibiting specimens at Meetings of the Society are requested to be good enough to hand to the Secretary, **at the Meeting**, a note in writing of the generic and specific names of all specimens exhibited, together with the names of the localities in which such specimens were obtained, and any remarks thereon which the exhibitors have to make. In the absence of such a note in writing the Secretary will not be responsible for any errors in connexion with his report of such exhibitions, or for the entire omission of any reference thereto in the Proceedings.

By Order of the Council.

MEETINGS

OF THE

ENTOMOLOGICAL SOCIETY OF LONDON,

11 Chandos Street, Cavendish Square, W.,

FOR THE

Session 1899–1900.

Wednesday, February	1
,, ,, ...	15
,, March...	1
,, ,, ...	15
,, April	5
,, May	3
,, June	7
,, October	4
,, November	1
,, ,, ...	15
,, December	6
1900	
,, January (Annual Meeting)	17

The Chair will be taken at Eight o'clock in the evening precisely.

Fellows are reminded that the Subscription for 1899 was due on the 1st January. They will save much trouble by forwarding the sum to the Treasurer promptly.

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ENTOMOLOGICAL SOCIETY OF LONDON.

Founded, 1833. Incorporated by Royal Charter, 1885.

OFFICERS and COUNCIL for the SESSION 1899-1900.

GEORGE HENRY VERRALL, *President.*

THE REV. CANON FOWLER, M.A., F.L.S.
EDWARD SAUNDERS, F.L.S.
ROLAND TRIMEN, F.R.S., F.L.S.
} *Vice-Presidents.*

ROBERT MCLACHLAN, F.R.S., F.L.S., *Treasurer.*

JAMES J. WALKER, R.N., F.L.S.
CHARLES J. GAHAN, M.A.
} *Secretaries.*

GEORGE CHARLES CHAMPION, F.Z.S., *Librarian.*

WALTER F. H. BLANDFORD, M.A., F.Z.S.
THOMAS ALGERNON CHAPMAN, M.D.
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ALBERT HUGH JONES.
FREDERIC MERRIFIELD.
JAMES WILLIAM TUTT.
CHARLES OWEN WATERHOUSE.

W. R. HALL, *Resident Librarian.*

Fellows who have paid their Subscriptions for the current year, are entitled to receive the Transactions and Proceedings for the year without further payment, and they will be forwarded post free.

The Library is open to Fellows and their friends every day from ONE to SIX o'clock p.m. (and until TEN p.m. on Meeting nights), except on Saturdays, when the Library closes at THREE o'clock.

N.B.—*The new Catalogue of the Library is now ready, price 9s. to the Public, to the Fellows of the Society, 6s.*

NOTICE TO AUTHORS, &c.

Authors of papers which are intended to be communicated to the Society, are requested to be good enough to send their names and the full titles of their papers, to the Secretaries at least fourteen days prior to the date of the Meeting at which it is proposed that such papers shall be read; and such communications may be addressed to the Secretaries at the Society's Rooms, 11 Chandos Street, Cavendish Square, W., or to CHARLES J. GAHAN, *British Museum (Natural History), Cromwell Road, S. W. Communications on matters other than the Society's publications may be addressed to the Secretaries, or to* JAMES J. WALKER, R.N., *23 Ranelagh Road, Sheerness.*

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